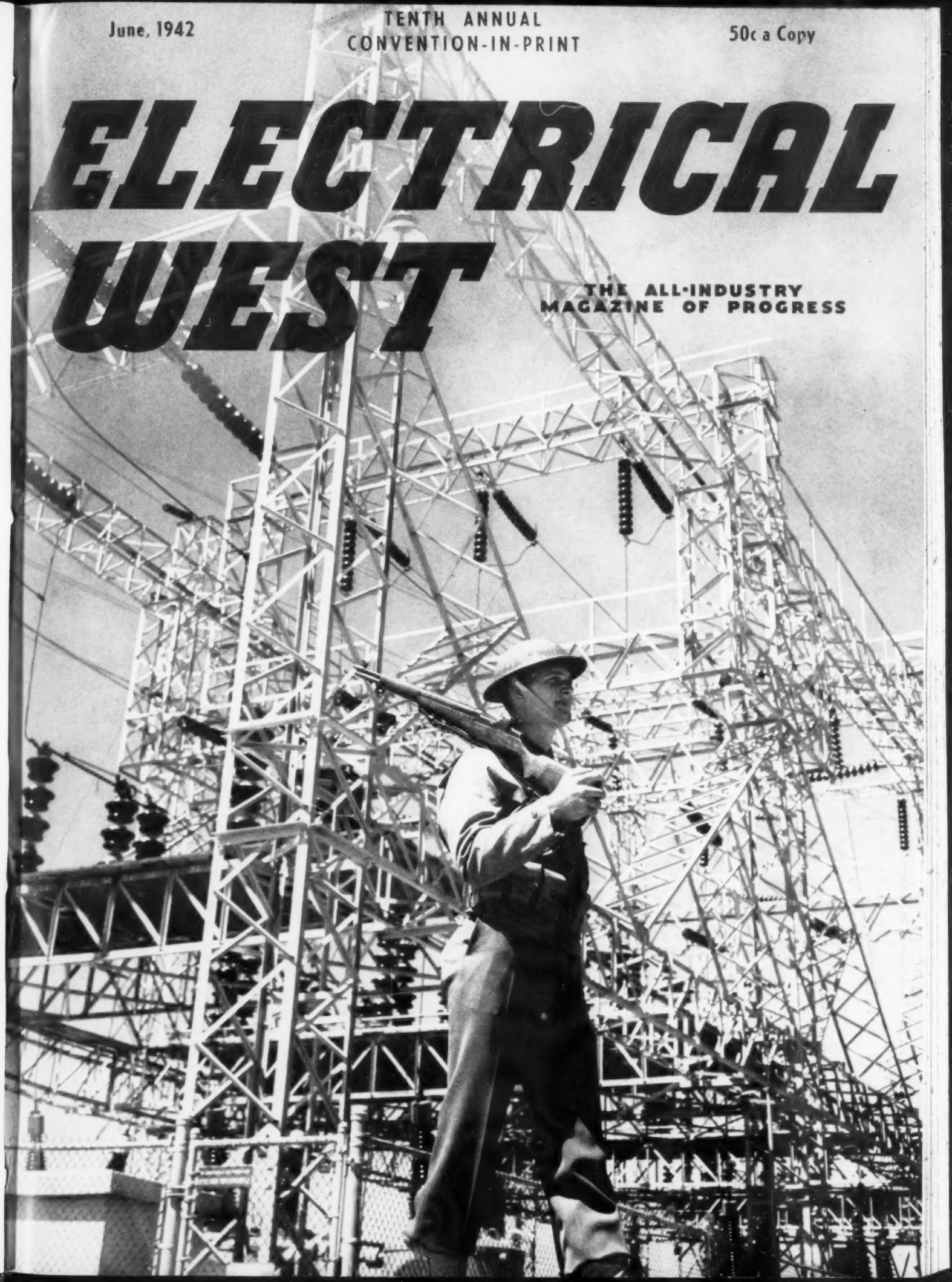
June, 1942

TENTH ANNUAL
CONVENTION-IN-PRINT

50c a Copy

ELECTRICAL WEST

THE ALL-INDUSTRY
MAGAZINE OF PROGRESS



WE *WILL* GO FORWARD TO VICTORY

"Be courageous. Be as brave as your fathers before you. Have faith. Go forward."

THOMAS ALVA EDISON

THIS LAST MESSAGE of Thomas A. Edison to the industry he served so well is full of meaning for each one of us. In these simple syllables sings the spirit of America...the spirit of a strong, united people whose courage, bravery and faith is equal to the task of defending the liberty which our forefathers, through the same qualities of character, secured for us. Here is our beacon to light the stern course which lies ahead. We will be courageous. We will be brave. We will have faith and go forward to victory.

Harris J. Bauer
PRESIDENT

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

SOUTHERN CALIFORNIA Edison

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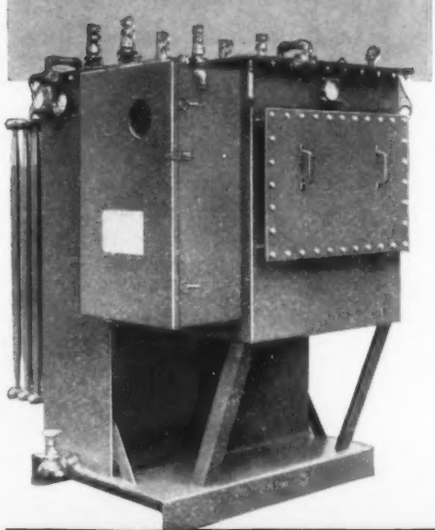
90,000 POUNDS OF COPPER*

350 MAN-HOURS*

*Savings on a typical 13.8-kv feeder by using regulators to maintain adequate voltage

You can really *save* with voltage regulators

Three-phase step regulator



TIME—the essence of all our war effort—as well as vital war materials can be saved by regulating feeder voltage. Regulators will bolster voltage that now sags under the heavy loads, permitting more electric power to flow through circuits supplying war plants.

A recent article in *Electrical World* (page 47, Jan. 10 issue) showed the surprising savings, cited above, that can be effected by using feeder-voltage regulators instead of re-building existing power lines or adding new ones.

And remember—voltage held at correct levels means good illumination for workmen, decreases waste and spoilage, and increases the response of motorized machines. Sum total—increased production!

REGULATORS OBTAINABLE QUICKLY

General Electric feeder-voltage regulators are obtainable promptly—for voltage control on circuits from 120 to 69,000 volts. Induction and step types—oil-filled, Pyranol, air-insulated—permit choice of a regulator *exactly* suited to the requirements. For complete information ask a G-E representative for Catalog GEA-2762B and Publication GEA-3779.
General Electric, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

404-29-5400

Here in the WEST

People

J. Clark Chamberlain

who tells understandingly of dealer adjustment to war conditions (p. 66) started in outdoor advertising, bought into a Frigidaire distributorship in 1926, became general sales manager; later left to be sales manager for San Diego county distributor in 1931. In Oct. 1932 he organized the Refrigeration Bureau, expanded it to include electric appliances in 1933. San Diego's electrical expositions he also started.

C. T. Bakeman

commercial and industrial sales manager for Puget Sound Power & Light, Seattle, who evaluates fluorescent lighting (p. 68) does so from a background of illuminating engineering and sales.

August C. Schwager

who tells of automatic circuit breaker reclosing, p. 95, is vice president in charge of engineering for Pacific Electric Manufacturing Co., San Francisco.

Pages

War Brings New Demands 51
By S. P. MacFadden

Let's Get It Done 53
By George Tenney

Post-War Program Vital 54
By J. W. Alexander

B. C. Electric Ready 55

When Will War End? 56

Why I Like My Job in the Electric Industry 60
PCEA Essay Contest Papers

Brightness Control 62

New Job for Sales Staff 63

Wartime Promotion 65
By James Lightbody

What Can Dealers Do? 66

How Light Can Help 68

Books 6

New Products 10

Bulletins 30

Electra 48

Sales 71

Business Guide 75

Northwest Reports—Index 79

Lighting and Wiring 108

Editorials 112

Associations 114

News 126

Profiles 150

Cover photo by Julian Robinson, Los Angeles Department of Water and Power.

Preview

Fever Speed

Artificial fever is produced by means of a device that transmits short wave beams through the human body, but in Oregon a plywood factory has turned this fever into wood and glues to speed drying and thus hasten manufacture of a useful wood product, plywood. Next month it will be described in these pages.

G. O. 95

Line construction standards have been under the cross pressures of change and scarcity of materials, yet because lives and property rely upon such standards for safety and performance, their revision is no light matter. Former general order 64 and 64-a of the California Railroad Commission, has been under revision for months, all factors being carefully weighed. G. O. 95 takes its place. Changes in it will be described next month.

Dim-out

has been ordered for the entire Pacific Coast from Mexico to the Oregon line. How it is being done will be told next issue, as well as the setting up of effective air-raid warning systems by cities.

New Studio

of NBC and the Blue Network in San Francisco incorporates latest lighting and electrical techniques. A picture story of the new studios and description of its facilities will appear to grace the pages of the July issue, among other interesting and useful articles and discussions.

New Strength Markings on O-B Insulators

TELL YOU WHAT YOU HAVE

● To save the time of linemen and storekeepers in identifying suspension insulators, O-B now marks the M & E strength rating on the cap of every 10-inch unit. Although these insulators vary widely in characteristics, they do look alike and it's a real puzzle to tell them apart readily—unless you're an expert. Aside from the advantage of saving time—all-important during a war—the new marking system prevents getting improperly rated insulators on a line, permits performance to be checked against ratings after the insulators have served a number of years, and helps in salvaging insulators for re-use should a line be moved or altered. The markings are the cataloged M & E strengths, and for O-B suspensions the figures significantly represent *minimum strengths.* To get suspension insulators having minimum mechanical strengths at least equal to their M & E ratings—and marked so you can tell just what you have—specify O-B.

Grind the Axis!

Practically every insulator, bushing and hardware item made by O-B during the past two years is now in active war service. They're installed on lines and substations feeding training camps, airports, navy bases, shipyards, steel mills, ordnance plants and hundreds of factories producing bombers, tanks and other war materials. Without sacrificing the high quality necessary for dependable insulation, we're turning out essential products at the fastest rate in our history. And we'll continue to make them at whatever rate is needed to help do a speedy, thorough job of crushing the Axis powers!

WIN WE MUST AND WILL

Ohio Brass

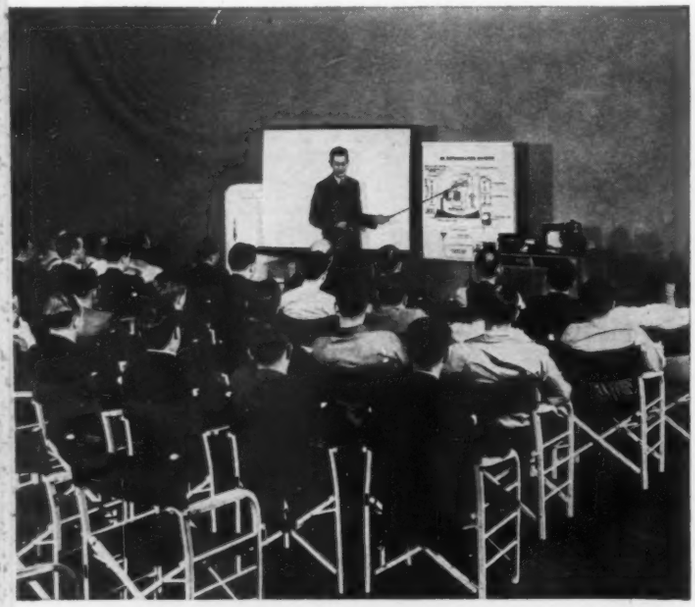
MANSFIELD, OHIO

2337-H

Canadian Ohio Brass Company, Ltd., Niagara Falls, Ont.

Announcing

A SERVICE TRAINING PROGRAM fo



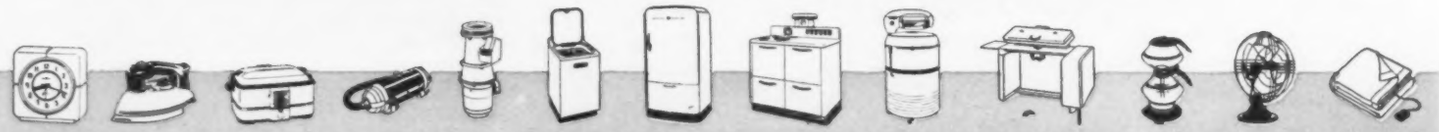
A complete set of charts aids C. E. Ring, G. E. refrigerator service engineer, in pointing out to an attentive group just how a sealed machine operates.

New sound slide films play an important part in all training meetings. Frame 103, at which the group is looking, shows how a common control adjustment is made.

Sound slide film frames are reproduced in booklet form. Before the meeting ends each service man receives his copy. It is invaluable as a guide to good service.

There's always time after the meeting for plenty of individual discussion. Here two interested service men get specific information on the famous Monitor top.

GENERAL ELECTRIC



for GENERAL ELECTRIC DEALERS

THIS IS YOUR OPPORTUNITY TO GET REPAIR AND MAINTENANCE TRAINING ON ALL G-E HOUSEHOLD APPLIANCE LINES

National Refrigerator Training Week

June 22 to June 27

IS FIRST OF THE TRAINING SERIES

HOW WELL and HOW QUICKLY you are able to repair your customers' appliances will largely determine your success or failure as a servicing dealer for General Electric household appliances.

In developing its product service program, General Electric kept this fact uppermost in mind. As a result, the newly announced dealer plan gives tremendously more emphasis to product training than to any other consideration. Already, most detailed and informative product training programs have been written on G-E laundry equipment, electric ranges, Disposalls and refrigerators. As time goes on, instructive material on other products will be developed, so that a servicing dealer may enjoy the benefit of the latest repair and maintenance technique uncovered by General Electric engineers and service specialists. Further, since training will be on a continuous basis, an "old" hand will have many opportunities to brush up on service, while the dealer who is compelled to employ fresh and unschooled "hands" at frequent intervals will find G-E's new training program increasingly valuable.

FIRST SCHOOL—REFRIGERATORS

The series of training courses will get off to a flying start with domestic refrigerator schools the week of June 22. This does not mean that refrigerator schools will not be held before and after that date . . . for they will be, many of them. It simply means that General Electric distributors want to start off these training meetings on a national scale . . . in a way that will give scores of G-E dealers and their repairmen an opportunity to get refrigerator training as early as possible.

Some of the schools scheduled as this goes to press are listed below. Whether or not you see listed a meeting in your area, get in touch with your regular General Electric refrigerator distributor for full details. Also, ask him how you can become an authorized Appliance Service Center dealer, and get the identification shown below. This mark of appliance service is one of distinction and is given only to G-E dealers who are in a position to render prompt, efficient service to owners of G-E home appliances.

SALUTE TO SERVICE

This 12-page book states General Electric's service policy and tells how you may become an authorized Appliance Service Center dealer. Ask your distributor for a copy.

ENROLL NOW IN ONE OF THESE REFRIGERATOR TRAINING MEETINGS!

N. EASTERN DIST.

Boston, Mass. . . . . June 23
Providence, R. I. . . June 25
New Bedford, Mass. June 26

METROPOLITAN DIST.

Monroe, N. Y. . . . . June 25
N. Y. C. . . . . Date not set

ATLANTIC DISTRICT

Reading, Pa. . . . . June 22
Allentown, Pa. . . . June 23
Williamsport, Pa. . . June 23
Lancaster, Pa. . . . June 23
Philadelphia, Pa. . . June 23
Wilmington, Del. . . June 23
Charlotte, N. C. . . . June 23
Wilkes-Barre, Pa. . June 24
Baltimore, Md. . . . June 24
Clearfield, Pa. . . . June 25
Harrisburg, Pa. . . . June 25
Bridgeton, N. J. . . June 25
Washington, D. C. . June 25
Raleigh, N. C. . . . June 25
Eliz. City N. C. Date not set
Danville, Va. . Date not set
Richmond, Va. Date not set
Norfolk, Va. . . Date not set
Roanoke, Va. . . Date not set
Lynchburg, Va. Date not set
Wytheville, Va. Date not set
Lexington, Va. Date not set

S. EASTERN DIST.

Columbia, S. C. . . . June 23
Tampa, Fla. . . . . June 23
Atlanta, Ga. . . . . June 25

E. CENTRAL DIST.

Cleveland, Ohio. . . June 22
Detroit, Mich. . . . June 23
Charleston, W. Va. June 23
Columbus, Ohio . . June 25
Syracuse, N. Y. . . . June 25
Cincinnati, Ohio. . . June 26

CENTRAL DISTRICT

Chicago, Ill. . . . . June 22
Rockford, Ill. . . . . June 23
Madison, Wisc. . . . June 23
Indianapolis, Ind. . June 23
Dixon, Ill. . . . . June 24
Appleton, Wisc. . . June 24
Terre Haute, Ind . . June 24
St. Louis, Mo . . . . June 24
LaSalle, Ill. . . . . June 25
Milwaukee, Wisc. . June 25
Peoria, Ill. . . . . June 26
South Bend, Ind. . June 26
Bloomington, Ind. June 29
Champaign, Ill. . . . June 30

W. CENTRAL DIST.

Denver, Colo. . . . June 22
Grand Forks, N. D. June 22
La Crosse, Wisc. . June 22
Kansas City, Mo. . June 22
Mankato, Minn. . . June 23
Joplin, Mo. . . . . June 24
Minot, N. D. . . . . June 24
Duluth, Minn. . . . June 25
Brainerd, Minn. . . June 26
Wichita, Kans. . . . June 26

S. WESTERN DIST.

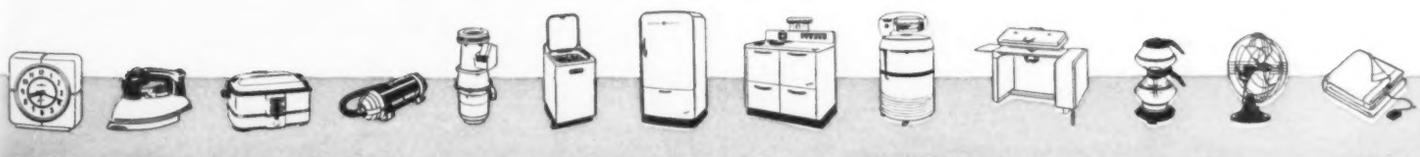
Oklahoma City . . . June 21
Dallas, Texas . . . June 23
Houston, Texas . . June 24
Little Rock, Ark. . . June 25
Beaumont, Texas . June 25
New Orleans, La. . June 25
San Antonio, Texas June 26
Tulsa, Okla. . . . . June 28

PACIFIC COAST DIST.

San Francisco, Cal. June 22
Seattle, Wash. . . . June 24
Salt Lake City, Utah June 24
Sacramento, Calif. June 24
Los Angeles, Calif. June 25
San Jose, Calif. . . June 26

AUTHORIZED GENERAL ELECTRIC APPLIANCE SERVICE CENTER

This sign identifies the dealer who meets the nine qualifications of a G-E appliance servicing organization.



RUBBER COVERED POWER CABLES • BUILDING WIRE
VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE
CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

It's a BIG ORDER, but

CRESCENT
WIRE & CABLE
is helping meet the need

Miles of copper wire and cable go into the manufacture of America's great bombers, tanks and ships. More miles go into the huge new plants that are building these weapons for the great allied offensive to come. CRESCENT, as in the last war, is playing an increasing part in the effort to meet the demand for

ELECTRICAL WIRES AND CABLES

WAR PRODUCTION 100%
CRESCENT INSULATED WIRE AND CABLE CO.

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

LOS ANGELES
Tri-State Supply Corp.
544 S. San Pedro St.

SAN FRANCISCO
Hodges & Glomb
1264 Folsom St.

KANSAS CITY
W. F. Howe & Co.,
2627 McGee St.

CRESCENT ENDURITE SUPER - AGING INSULATION

BOOKS
you may want

INDUSTRIAL ELECTRICITY, by Chester L. Dawes, Part II, second edition. McGraw-Hill Book Co., N. Y., $2.75. A book on the elementary theory of alternating current circuits and equipment especially as they relate to industrial applications. As it is not intended for use by advanced electrical engineering students, mathematics is kept at a minimum throughout and is omitted wherever possible, though a knowledge of trigonometry is essential to an understanding of the text.

Information on the cathode ray oscillograph and welding practice in the fabrication of electrical machinery has been added, while information on measuring instruments, analysis of alternator operation, power conversion units such as the metal tank rectifier, and vacuum tubes is more detailed than in the first edition. Due to lack of space and the complexity of the subject, the chapters in the first edition covering illumination and interior wiring have been eliminated.

One of the most excellent features of the book is the large section devoted to practice questions and problems.—W. N.

ELECTRICAL ILLUMINATION by John O. Kraehenbuehl, Prof. Electrical Engineering, University of Ill., John Wiley & Son, Inc., $3.75. With special emphasis upon the architectural usages of light, this book likewise covers the underlying principals for specification and design in the lighting of commercial and industrial buildings. The chapters on flood lighting of buildings and of novelty lighting, making use of a number of ingenious effects, are especially good. The author treats them completely as a result of the frequency of demand for such information by the architectural profession and by students. "Although general illumination design is capably handled by both architects and utility advisors, the methods available for designing floodlighting and novelty lighting are much less understood," the author states. A final chapter on wiring presents the designer of illumination with the necessary wiring information to keep voltages what they should be.

AMERICAN RECOMMENDED PRACTICE OF INDUSTRIAL LIGHTING, 51 pages, 6 x 9, single copies 25c, quantity prices, prepared by the Committee on Lighting Practice of the Illuminating Engineering Society, 51 Madison Ave., N. Y. This report has been accepted by the American Standards Assn. as American Recommended Practice A-11-1942. It presents factory owners and operators with a guide to good, up-to-date lighting practice, superseding the IES revised *Code of Lighting: Factories, Mills and Other Work Places.*

Distinguishing feature of this new edition, according to the IES, is its emphasis upon basic principles of good lighting, including correlation between lighting and plant safety, salient differences between good and poor illumination and some of the precautions which must be observed before adequate and suitable lighting can be achieved and maintained.

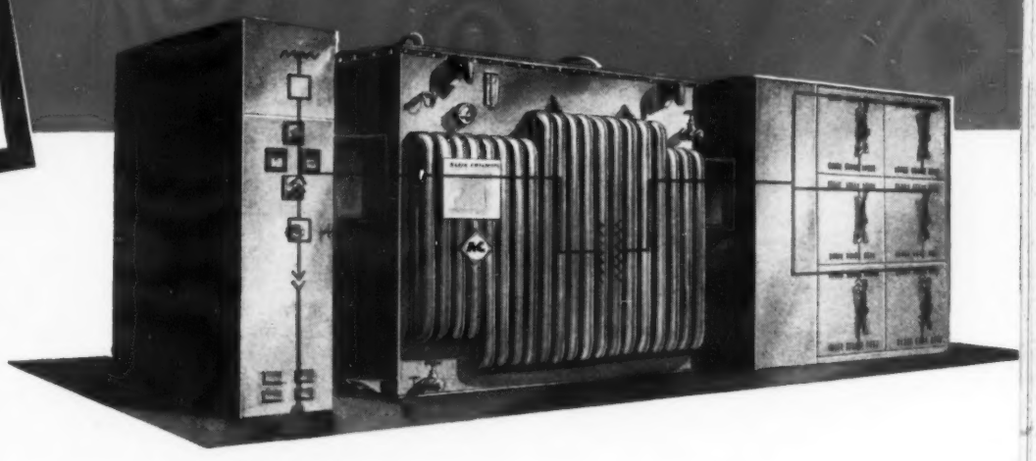
Factors of good illumination are discussed in detail with regard to both quality and quantity of light. Specific attention is paid to glare and to distribution and color of light. Minimum standards of illumination are recommended, with minimum operating footcandles for various seeing tasks.

PRINT IN BINDING

Announcing...

the first standard load center unit substation!

Allis-Chalmers Now Offers Packaged Units for Modern Load Center Power Distribution! Get Quicker Deliveries...Lower Costs!



Here's an announcement of importance to every engineer responsible for power distribution . . . a new development that can save you time and money!

Allis-Chalmers now offers you a standard load center unit substation . . . a packaged unit that eliminates delays on the drafting board caused by "special" design. Think what that can mean to you in faster deliveries . . . in lower first cost!

What's more, this modern method of load center power distribution remains completely flexible . . .

On the high voltage side, you can have potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear, or direct connection through terminal box. On the low side, stationary or drawout air breakers, electrically or manually operated, are available. Transformers can be dry type, oil, or non-inflammable Chlorextol-liquid-filled.

Equally important, load center distribution eliminates long secondary runs of heavy copper . . . helps conserve this vital material. Voltage drop is reduced — motor and lamp performance improved. Specifying and buying are made easier . . . installation quicker . . . distribution planning simpler.

Get all the facts on the standard Allis-Chalmers Load Center Unit Substation! Call the district office near you. Or write direct to Allis-Chalmers, Milwaukee.

A-1515

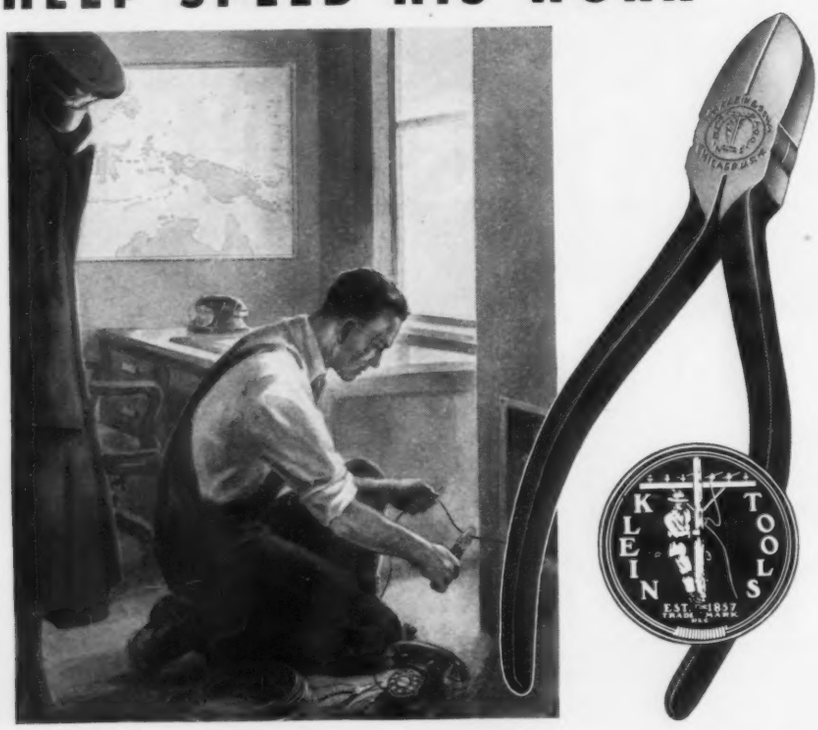
When On-the-Line Performance Counts... Count On—

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

KLEIN'S

HELP SPEED HIS WORK



War has placed a new strain on communication systems—on power lines—on public utilities everywhere. The men responsible for keeping these services working at maximum efficiency are finding the hours in a day too short.

Under conditions like these, good tools are doubly important. The high quality, the extreme care in manufacture, the time-tested design that characterize Klein tools—all are proving their worth in aiding linemen and electricians everywhere.

ASK YOUR SUPPLIER

Foreign Distributor: **International Standard Electric Corp., New York**

Mathias KLEIN & Sons

Established 1857 — Chicago, Ill., U.S.A.

3200 BELMONT AVENUE, CHICAGO

ELECTRIC CIRCUITS AND MACHINERY, by Frederick W. Hehre and George T. Harness, John Wiley & Sons, Inc., N. Y., $6. An elementary text written for use in a general course for non-electrical engineering students as well as an introductory text in alternating current circuits and machinery for electrical engineering students. The fundamental concepts and mathematics of AC circuits are covered very completely, as are the fundamentals of transformers, generators and motors. The chapter on complex notations and operators is exceptionally lucid and thorough. Less exhaustive and less mathematical explanations are also given of the theories of vacuum tube amplifiers and rectifiers, electrical instruments, transmission lines and other items.

The book is intended primarily as a textbook for college students with a good mathematical background including some knowledge of calculus. It could not be considered as a reference book for practicing engineers, but would be very excellent for non-practicing graduate electrical engineers who wish to refresh their knowledge of theory.—W. N.

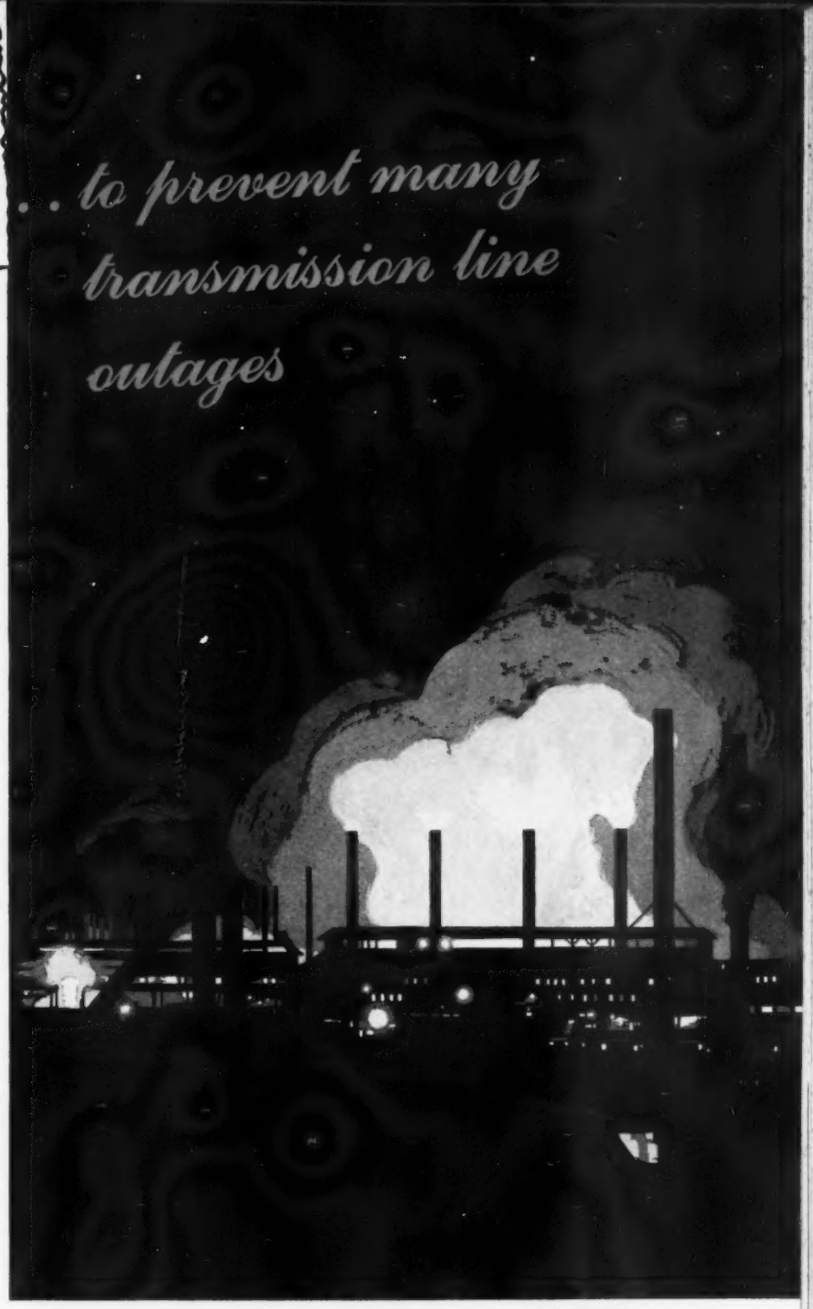
GLASS THE MIRACLE MAKER, by C. J. Phillips, Corning Glass Works, 436 pages, 6 x 9, $4.50, Pitman Publishing Corp., N. Y. This book is calculated to give the reader an accurate, up-to-date, fairly broad understanding of the technology and applications of glass and is designed to meet the needs of civil, mechanical, electrical and chemical engineers; industrial designers and executives; and students. It takes up the history, manufacture, chemistry, physical and chemical properties as well as applications of glass. Contents includes chapters on Glass in Electrical Transmission and Communication; Glass in Illumination; Fiber Glass, including its use as electrical insulation.

ELECTRICAL WIRING SPECIFICATIONS edited by Earl Whitehorne, McGraw-Hill Book Co., $2.50. Two or three special specification issues of Electrical Contracting magazine compiled by the editorial staff proved the need for a book of this type and Whitehorne, in collaboration with the editorial staff, combined such material into a compact, 180-page book with a preliminary chapter "Taking the gamble out of wiring" to lay down the fundamentals. The book is in two parts, one for wiring of residences, apartment houses and farms and the second part for commercial, institutional and factory buildings. It is amply illustrated and supplemented with an appendix containing Code tables.

ENGINEERING AS A CAREER, vocational guidance booklet published by the Engineers' Council for Professional Development, 29 West 39th St., N. Y. 36 pages, 6x9, paper cover; 10c, discount on quantity orders. This booklet is intended for high school students and their advisors and gives a general picture of the characteristics and requirements common to all branches of the engineering profession.

SECOND REPORT, E.E.I.—NEMA Joint Committee on Standards for Distribution Transformers, 25c (members), 60c (non-members.) This second report establishes design standards for certain mechanical and electrical features of single phase, pole type distribution transformers rated 100 kva. and below, 15,000 volts and below.

Here's How ... to prevent many transmission line outages

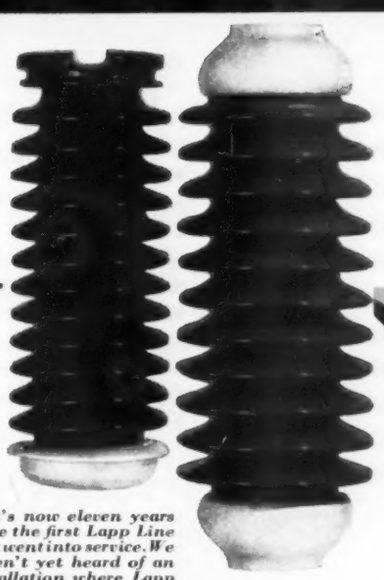


America cannot afford Service interruptions

Today THE TOOLS of Victory are being produced in thousands of factories and shops, the management and workmen of which realize the importance of their all-out effort. Many in your territory depend on you for light and power. Service interruptions are costly to your company, crippling to a nation at war.

If you could eliminate the possibility of failure from high-voltage insulators on transmission lines and substations, you would have gone a long way toward the elimination of service interruptions. We cannot promise you that use of Lapp insulators will guarantee the impossibility of *all* line outages, but we can pass on to you the experienced word of hundreds of transmission engineers, "Lines and stations on Lapp Post insulators have fewer outages."

Such reports are a natural thing, because the Line Post and the Station Post are built to give full-measure performance, and to eliminate the features of weakness of conventional insulators. The combination of freedom from puncture and cracking hazards and ruggedness under arcover, mechanical attack and atmosphere contamination are adequate justification for specifying "Lapp Line Posts and Station Posts" for every transmission line and substation rebuilding or new-construction job.



Lapp

• It's now eleven years since the first Lapp Line Post went into service. We haven't yet heard of an installation where Lapp Posts haven't given the best service of any insulator in the history of the system.

LAPP INSULATOR COMPANY, INCORPORATED • LE ROY, N. Y.

Win the WAR ON WASTE

• Now is the time to wage war on waste. Food conservation—labor, fuel and energy can best be done the electric way.

Many users of Lang electric commercial cooking appliances tell us of their experiences in saving, speeding up operations and in turning out better quality meals. Lang construction assures long life and efficient operation. Lang automatic controls save time and effort of chefs.

Today, Lang is building for the army, navy and—Victory. These orders are the FIRST orders of the day. However, we can take care of our commercial customers, too.

We urge anyone considering the purchase of Lang electric equipment to plan ahead and order ahead.

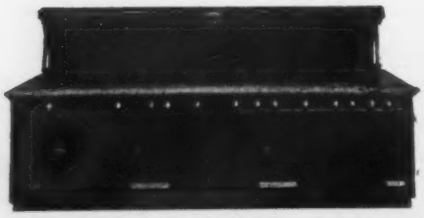
F. S. LANG MFG. CO.

Portland—Seattle—Spokane

Builders of

LANG

STANDARD AND CUSTOM-BUILT HEAVY DUTY ELECTRIC RANGES, COOKING TOPS, OVENS, GRIDDLES.



PRODUCTS

that are news

Blackout Control (600)

A photoelectric lighting control has been designed by General Electric Co. for blackout use. Called the "Light Watchman," a photoelectric relay, actuated by the nearest street light, turns off lights in the show window, sign or protective lighting system it is guarding. When the street light goes on again the controlled lights are again energized. The relay is highly directional, according to the manufacturer, and is subject only to the control of the street light at which it is aimed. A short time delay prevents false operation of the relay by momentary flickering of street lights. Operation of the device will not affect the normal functioning of a time switch used to turn on and off the lights at a preselected time. Available in indoor or outdoor types.

Unit Substations (601)

Allis-Chalmers Mfg. Co. has available new standardized load-center unit substations in sizes ranging from 100 to 2,000 kva. According to the manufacturer, these unit substations are extremely flexible and offer a wide choice of incoming and outgoing-line arrangements. The substation consists of a metal-enclosed incoming-line section, a throat-connected transformer and a low-voltage feeder section. On the high-voltage side potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear or direct connection through terminal box can be supplied. On the low-voltage side, stationary or drawout air breakers, electrically or manually operated, are furnished. Transformers can be oil immersed, dry type, or non-inflammable Chlorextol liquid-filled, the announcement states.

Insulating Varnish (602)

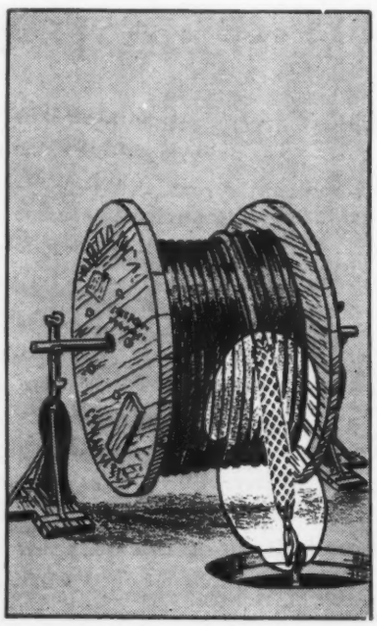
A new insulating varnish designed to withstand high temperatures has been developed by Westinghouse Electric & Mfg. Co. to meet coil insulation requirements of generators. The varnish, which is known as Thermoset, is a synthetic resin-type cured by heat-induced chemical polymerization. It sets to an infusable flexible inert film of clear amber color and is high in dielectric and bonding strengths, according to the manufacturer. Thermoset is said to be water and oilproof; unaffected by acids or alkalis in ordinary concentrations. When cured it will protect enamel coating on magnet wire, will not corrode uncoated metals and will guard against rust, the manufacturer states.

Disconnect Switch (603)

Delta Star Electric Co. is offering a new 3,000-amp., 23-kv. hook stick-operated disconnecting switch. High pressure silver to copper contacts at both ends; a design embodying a straight line current path with current carrying parts of hard drawn copper and eliminating castings are advantages claimed by the manufacturer. Rugged locks and a pressure releasing device are standard equipment; clamp-type lugs for IPS tubing or switch pads for square tubing or flat bars can be furnished. Available in capacities from 2,000 to 6,000 amp. and up to 34.5 kv. ratings.

SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable

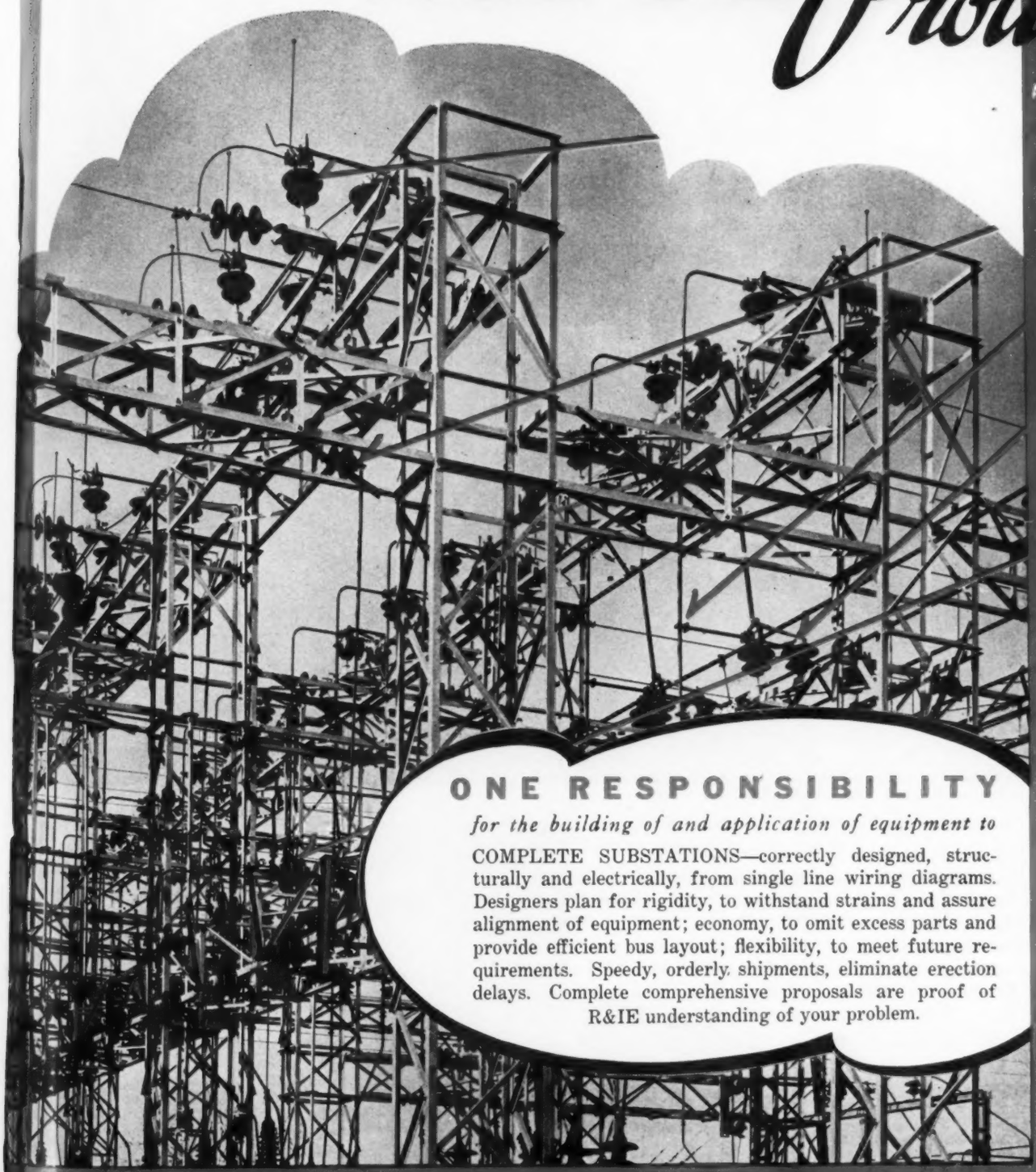
These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable ELECTRIC COMPANY

OVER 30 YEARS SERVICE TO THE UTILITIES

3145 CARROLL AVENUE - CHICAGO, ILLINOIS

CHECK THE FACTS on R&IE Products



ONE RESPONSIBILITY

for the building of and application of equipment to

COMPLETE SUBSTATIONS—correctly designed, structurally and electrically, from single line wiring diagrams. Designers plan for rigidity, to withstand strains and assure alignment of equipment; economy, to omit excess parts and provide efficient bus layout; flexibility, to meet future requirements. Speedy, orderly shipments, eliminate erection delays. Complete comprehensive proposals are proof of R&IE understanding of your problem.

ENGINEERING AND PRODUCTION

COMPLETE SUBSTATION

OPERATING MECHANISMS

AIR BREAK SWITCHES

BUS CLAMPS

CONNECTORS

DISCONNECTING SWITCHES

CUTOUTS

THERMO-RUPTERS

METAL HOUSED, SEGREGATED BUS

AUTOMATIC THROW-OVER EQUIPMENT

METAL CUBICLES

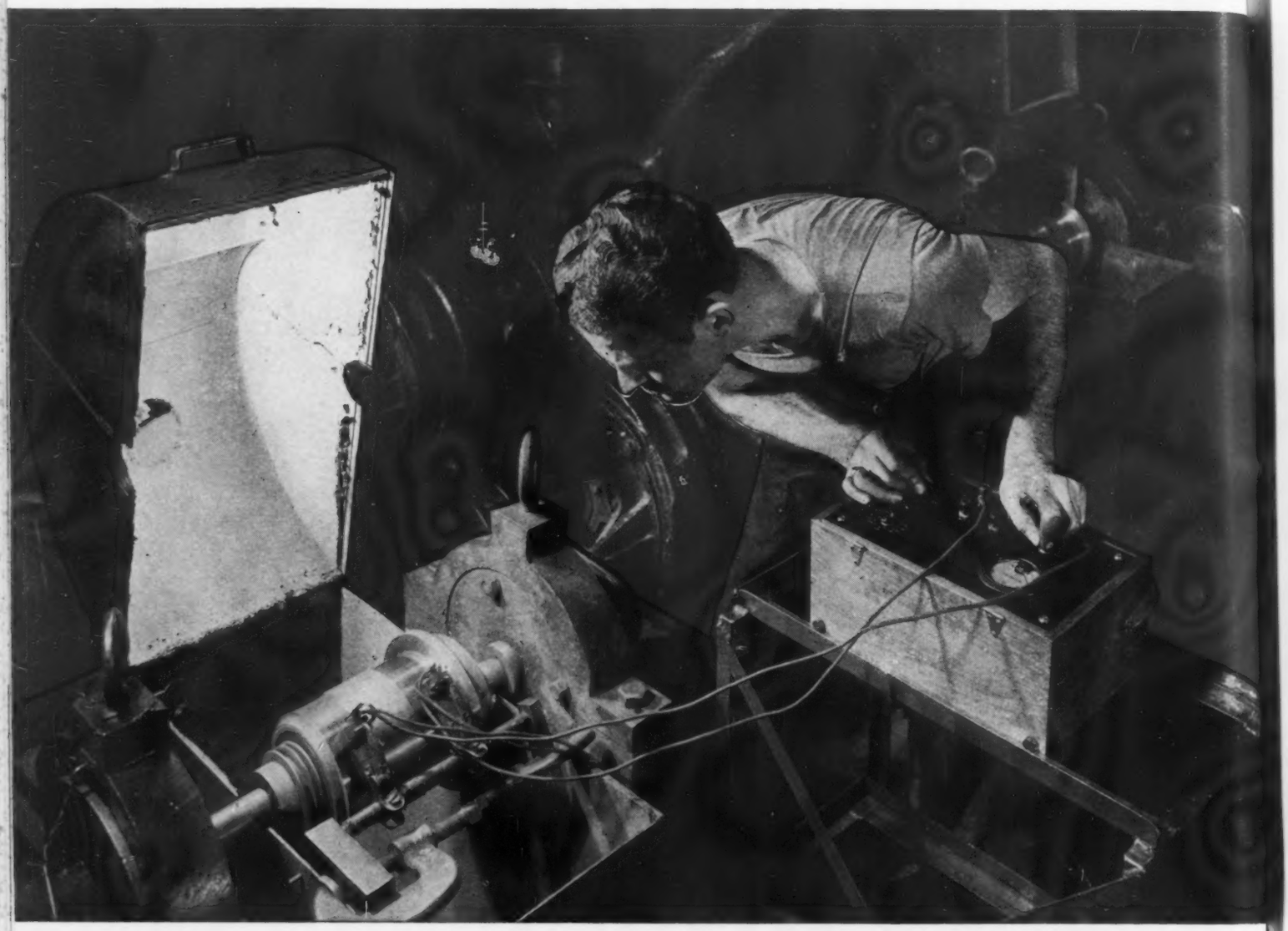
INTERLOCKS

TESTING DEVICES

RAILWAY AND INDUSTRIAL ENGINEERING CO.

GREENSBURG, PA. . . . . IN CANADA, Eastern Power Devices, Ltd., Toronto

use this 4-way service



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FREE

HINTS ON HOW TO MAINTAIN ELECTRICAL EQUIPMENT

Continuous production depends on proper maintenance. This book will help. Thousands of maintenance men are already using it. Gives timely tips on the care and maintenance of electrical equipment. Published in two volumes. You can have both. Vol. I is wire-bound. Vol. II is loose-leaf so additional booklets can be added as released.

Fill in the coupon now and mail it today. When we receive your request your name will automatically be placed on our mailing list to receive Westinghouse Maintenance News—another free publication for maintenance men, issued periodically to give latest news on maintenance methods.

Westinghouse Elec. & Mfg. Co.,
East Pittsburgh, Pa., Dept. 7-N

Maintenance Sales Dept.:

Please forward copies of Maintenance Hints, Vol. I and Vol. II, and place my name on your mailing list to receive both the regular Maintenance Hints bulletins and Maintenance News.

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to keep your machines on the job

1 **Renewal Parts Warehouses**
17 warehouses conveniently located throughout the country now carry an adequate stock of frequently used renewal parts.

2 **District Repair Service**
33 manufacturing and repair plants are strategically located to speed repair service.

3 **District Engineering Service**
Experienced engineers in every industrial district are available to help solve production problems.

4 **Free Help for Maintenance Men**
Valuable information on how to keep electrical equipment on the job.

With Victory in the production line, the most important job today is to keep present equipment running at full capacity. To do this calls for better maintenance, for quick replacement of worn parts, for speedy repair work when necessary. To help you get longer life from your electrical equipment, Westinghouse is prepared to help you in these four ways:

First Westinghouse has established 17 warehouses where you can obtain renewal parts quickly. Stocks on hand include those parts normally subjected to wear or burning such as contact tips, shunts, arc chutes, operating coils, armature and field coils, bearings, etc. Be sure your own stock of renewal parts is adequate to meet emergencies. When it runs low order direct from our local office.

Second Westinghouse has arranged to facilitate major repair work. In addition to the 17 parts warehouses, Westinghouse has established 33 district manufacturing and repair plants. Each of these plants is equipped to repair, remodel or recondition electrical apparatus. This includes rewinding motors, generators and transformers; replacing or building up worn parts such as bearings, commutators and current collectors; reblade and reline turbines, or remodel them for other operations.

More than 4,000 employes are now serving our customers from these 33 Westinghouse district plants alone. To save time on repair service, call our local office.

Third Experienced engineers are available at every Westinghouse office to help you with your electrical and production problems. These men are constantly working with plant engineers in all types of industries. Problems that occur once in the lifetime of a manufacturer are often daily occurrences with our engineers. Thus, problems solved in one plant provide a quick answer to similar problems elsewhere. Maybe these men can help you, too.

Fourth One of the most important single group of workers in your plant is your maintenance crew. These men deserve all the help you can give them.

Westinghouse has prepared a valuable book on the care and maintenance of electrical equipment. Pocket-size, it gives helpful hints on the care of linestarters, bearing lubrication and maintenance, tips on general inspection and many other suggestions on how to keep electrical equipment on the job.

"Maintenance Hints" is free. Each of your maintenance men should have a copy. To be sure they get one, fill in the coupon now and mail today.

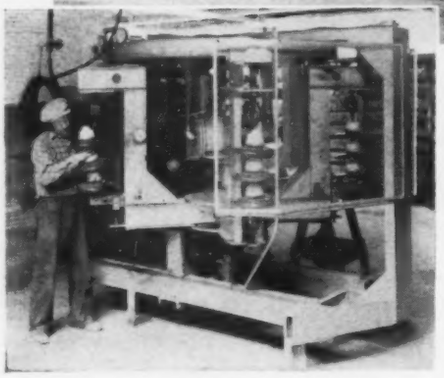
All of the above services are available through our local office. A phone call will bring you any one or all of them.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

J-94489

Westinghouse

TIME SAVER FOR AMERICAN INDUSTRY



One of Victor's automatic testing machines making final pull test on suspension units.

Insulators **HELP TO** *win wars* **TOO!**

◆ **Production is absolutely dependent on power. The constant uninterrupted flow of electrical energy to the war plants of the nation is essential to win the war. Not one ampere at one volt over one ohm of resistance can be transmitted without good* insulators. The insulator is the CORNERSTONE of electrical power transmission. That is the conviction of every member of Victor's family of workers. It is daily spurring them on to produce more and more safe, lasting and economical insulators. The best insulators money can buy.**

MAYDWELL & HARTZELL
INCORPORATED

*All Victor Insulator data and characteristics shown in our catalog are based on the results of REGULAR and FREQUENT impartially conducted tests.

THE MARK OF V GOOD INSULATORS

VICTOR INSULATORS INC.
VICTOR, NEW YORK

Industrial Lighting Unit (604)

A new line of industrial fluorescent fixtures has been announced by LaSalle Lighting Products, Inc. A feature is a tube tray, attached to the trough, to hold the fluorescent lamps out of the way while the maintenance man is relamping or cleaning the fixture, according to the manufacturer. Starters are accessible from the outside and can be replaced without removing the tubes. Made for 40-watt, 48-in. tubes, the fixtures are available either in two- or three-light models; high power factor; 60 cycle AC., the manufacturer states. Provision in two-light type for addition of an extra tube and ballast; installation fittings interchangeable.

Spero Fixture (605)

Added power and length furnished by the two 100-watt fluorescent lamps and high efficiency in construction and design are advantages claimed by the manufacturer for the new Spero IU-260 industrial-type unit. Furnished both for chain or rigid suspension. A reflector factor of 88% is claimed by the manufacturer. Power factor corrected; completely wired including pull switch (110-125 AC); outside finish coppertone; $43.73 less tubes FOB Cleveland.

Street Lighting Control (606)

Street lighting control by means of a series-multiple relay has been announced by the General Electric Co. With a unit known as the Type RIL Norvalux relay a series street lighting circuit can control another series circuit or any nearby multiple circuit. While intended primarily for street lighting control, this series-multiple relay also can control display windows and spectaculars, according to the manufacturer. The unit consists of a small AC contactor mounted on and connected to the secondary of a Type IL transformer. With the transformer supplied from a series circuit, the relay will be energized as long as the current flows in the series circuit. Contacts may be open to de-energize any circuit connected to it when the series circuit is shut down, or closed to turn on blackout lighting for the duration of a blackout.

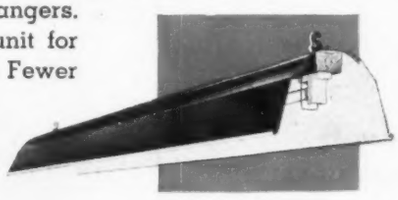
INVESTIGATE THE POSSIBILITIES FOR INCREASED PRODUCTION WITH THESE NEW CURTIS INDUSTRIAL LIGHTING UNITS

FOR VICTORY BUY UNITED STATES DEFENSE BONDS STAMPS

For HIGH INTENSITIES IN HIGH BAYS

Curtis Catalog No. 1570, unit for the 3 KW Mazda AH-9 (Mercury) lamp. Efficient, rugged unit of steel with porcelain enamel reflecting surface. Easily installed from hook hangers.

In most cases one unit for a bay is sufficient. Fewer units mean low maintenance and lighting installation cost.



X-Ray SILVER MIRRORED GLASS REFLECTOR units for 750-1000 or 1500 watt P.S. lamps or 400-watt Mercury Vapor Lamp. Simple to install, efficient and comfortable in operation. Unit is available with steel housing (as illustrated), **Cat. No. 1589;** with tripod holder and steel ring at bottom of reflector, **Cat. No. 589T;** or with clamping type holder only, **Cat. No. 589.**

Write for information on these new units or get in touch with the Curtis representative in your area.

For THE GENERAL FACTORY AREA—LONG LINES OF LIGHT

"Tops" for simplicity and economy, these units can be wired for either 2 or 3 40 watt lamps per section. When two lamp units are installed the third lamp can be wired in later to build up intensities as required. Wiring channel sections without reflectors or lampholders are also available, and equipment to convert these sections into additional lighting units can be added later.

Units are of open type with high efficiency Fluracite reflecting surface.

A sliding clamp bracket simplifies suspension from chain or cable. **Catalog No. 1502** for two 40-watt lamps and **Cat. No. 1503** for three 40-watt lamps.

CURTIS LIGHTING, INC.

6135 W. 65th STREET . . . . . CHICAGO

THIS IS THE TAG THAT HELPS KEEP 'EM FLOWING

Graybar Quality Since 1869 *Reg. U.S. Pat. Off.

Everything Electrical . . . THAT IT TAKES TO WIN!

Lloyd

Covers the Country

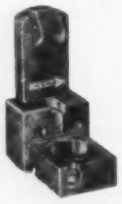
. . . with Fluorescent Lamp Holders, Starters and Starter Sockets

- None are made better.
- None will last longer.
- None are more efficient

For lighting the factories of war.

Listed and Approved by Underwriters Laboratories Inc.
Approved by Canadian Engineering Standards Association
Certified by Elec. Test. Lab.—Spec. 6

Twist Type Lamp Holder
Blk. Cat. 353
Wht. Cat. 353-W
Combined with Starter socket Cat. 252
Patented



Push Type Lamp Holder
Blk Cat. 253
Wht. Cat. 253-W
Combined with Starter Socket Cat. 252
Patented

Remote Starter Socket with "Lobster Claw" Dual Lock Contact
Cat. 352
Patented

Starter
FS-2 15-20-watt
FS-4 30-40-watt
Certified by Elec. Test. Lab.
FS-6 100-watt
FS-4 NA "NO-BLINK" 30 and 40-watt
Patented

"LLOYD POLICY INSURES QUALITY"

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G-E Autotransformers (607)

To provide smooth, adjustable control of uninterrupted voltage and of small amounts of power, General Electric Co. has announced a line of variable-voltage autotransformers which it claims are light in weight, small in size, mechanically strong and are well suited for use in factories, laboratories and schools or for assembly with other equipment. These units are designed for panel and bench mounting and can be supplied without the enclosing cases for built-in applications. Advantages claimed by the manufacturer are high efficiency and excellent regulation throughout the entire range from no load to full load; operation on low input power and low exciting current.

The input circuit is connected to a winding made up of carefully spaced turns of the round conductor. Connection to the output circuit is provided by a carbon brush which is kept in constant contact with a non-insulated portion of the inside winding. Each turn of the conductor gives a different step in voltage. By changing the position of the brush, the output voltage can be varied uniformly without interrupting the load current, according to the announcement. The dial on the cover is calibrated to indicate from 0 to 100% of maximum output voltage.

Fan-Cooled Motor (608)

A new fan-cooled enclosed motor has been developed by the Crocker-Wheeler Electric Mfg. Co. Ventilating air is blown over the external ribs and is not forced through in-

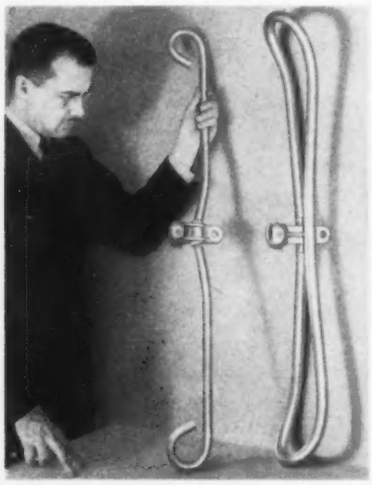
ternal passages, which, the manufacturer states, gives trouble free operation even in atmospheres containing excess amounts of destructive fumes, abrasive dust, oil or dirt. Available in standard NEMA frame sizes up to 20 hp., either ball or sleeve bearing equipped.

Insulation Material (609)

Providing non-bulking slot insulation for use in confined or limited space, new thin types of IRV-O-Slot have been announced by Irvington Varnish & Insulator Co. IRV-O-Slot insulation consists of Fish or Spauldo papers coated with resin, or bonded by means of a plastic insulator, to cambric, silk or Fiberglas. According to the manufacturer, these insulations possess ample strength and toughness as protection against mechanical stresses; have high dielectric strength; are flexible and easy to form. Duplexed IRV-O-Slot and Spauldo paper have exceptional heat resistance and bonded insulations have high moisture resistance, it is claimed. Available in sheets and tape form.

Arcing Horns (610)

Ohio Brass Co. has developed two types of boltless arcing horns for attachment at the bottom of insulator strings to protect conductors on high-voltage transmission lines from power arcs. Both devices are made of pipe to eliminate sharp edges and are said by



the manufacturer to be free of radio interference at voltages well above their recommended line ratings. Other advantages claimed are the 40-in. over-all length; increased coverage and larger, heavier metal sections. One style, called the Longhorn, is intended for 115, 138 and 161-kv. lines; the other, the Bighorn, is suitable for lines up to and including 230-kv., according to the manufacturer.

Black Cable Paint (611)

A black cable paint which it claims has excellent weather-resisting properties has been developed by the John C. Dolph Co. Known as No. 737, the paint is said to be absolutely oil and waterproof, extremely flexible and flame resistant one hour after application and highly resistant to corrosive fumes and heat. Supplied at heavy brushing consistency and provides a build-up of 8 mils per coat: air dries in 15 minutes; available in 1, 5, 30, 55-gal. containers.

Blackout Alarm (612)

A photoelectric control for blackout alarm in factories and other large plants has been developed by Photoswitch Inc. The control is placed in a convenient location viewing a centrally controlled street lamp. Through the photoswitch are connected alarm systems operating inside the plant and, when the street lights are turned out, the device observes this and a warning signal is sounded.

Trucolite Unit (613)

Edwin F. Guth Co. announces that its Trucolite unit is now available with eggcrate louvres or diffusing glass bottom. According to the manufacturer, the new eggcrate louvres permit strong downlight with comfortable shielding at all normal angles of vision and the glass shield diffuses and transmits the light yet presents a low-surface brightness. The new Trucolite end is of stamped steel with K.O.s for tying fixtures together in continuous runs.

WHY PAY FOR A FEW —when EMPIRE gives you ALL SEVEN!

1. DIELECTRIC STRENGTH
2. TENSILE STRENGTH
3. ELONGATION
4. PLIABILITY
5. FINISH
6. UNIFORMITY
7. RESISTANCE TO AGING

GET THIS QUALITY INSULATION FOR YOUR ELECTRICAL EQUIPMENT, SPLICING, MOTOR REPAIR WORK

You're paying for all 7 of these advantages in any Varnished Cambric Tape or Cloth you buy. Why not specify EMPIRE—it costs no more to be sure of all 7.

Through years of experience and research, we have developed Empire Tapes and Cloth to the point where they earn top rating from every standpoint. Both equipment manufacturers and power companies have proved this in searching tests. And they back it up with orders and reorders whenever this type of material is needed.

If you need Varnished Tape or Cloth send the coupon for a stock sample of Empire. Subject it to your own tests for first-hand evidence of its all-round excellence.

USE THE COUPON TODAY!

ANGUS-CAMPBELL, INC. (Agents for Mica Insulator Co.) | 2122-4th Ave. Seattle, Wash. | 449 S. San Pedro St. Los Angeles, Cal. | 235 San Bruno Ave. San Francisco, Cal.

Send me samples and prices of: Empire Straight Cut Cloth Yellow .007 .010 Black .007 .010

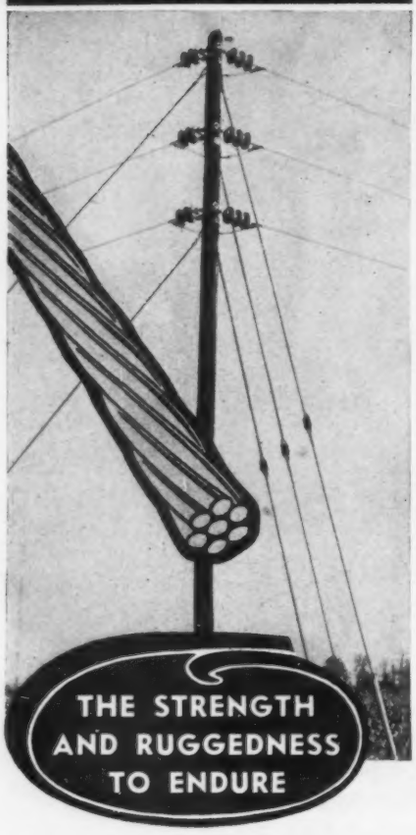
Empire Seamless Bias Tape Yellow .010 Black .010

Name _____ *Title* _____

Company _____

Address _____

Crapo
GALVANIZED STEEL
STRAND



THE STRENGTH AND RUGGEDNESS TO ENDURE

STRENGTH to support the pole structure under maximum ice and wind loading ... RUGGEDNESS to withstand the punishment incurred in construction and service .... DURABILITY that outlasts the normal life of the line .... are combined---with important ECONOMY---in *Crapo* Galvanized Steel Strand.

Each size and grade develops the full tensile strength of the steel in cross section. The heavy, ductile, tightly-bonded zinc coating---applied by the famous *Crapo* Galvanizing Process---provides lasting protection against corrosion.

There is a size and grade of *Crapo* Galvanized Steel Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

Fresnel Luminaires (614)

Fresnel luminaires for protecting industrial plants against sabotage have been announced by the Westinghouse Lighting Division. Two types are available (SF-180 and MF-180) for series and multiple circuits respectively. Essential parts of the units are a cast iron hood with socket and receptacle, mounting bracket, reflector and lens assembly. They may be mounted on poles and building walls.

Fluorescent Units (615)

A new series of fluorescent luminaires is being manufactured by Lighting Products, Inc., and is available in one-two-three or four lamp 40-watt units. The units are for surface or pendant mounting and are supplied with knockouts in each end to permit continuous strip installations of either type. All steel fixture body with metal frame and ends; wired complete with high power factor ballasts; reflection of 80 to 82% claimed by the manufacturer.

Heavy Duty Cleaner (616)

Breuer Electric Mfg. Co. has designed a new Tornado model, Hi-Cycle Vacuum cleaner, which it claims is particularly suited for continuous, heavy-duty cleaning where production lines must proceed without interruption. According to the manufacturer, this unit is light weight, portable, durable and suited to high-speed operation. The motor operates on 220-volt, 180-cycle current; unit equipped with 20 ft. of 4-conductor cable but without socket or attachment plug.

PlastiLux Unit (617)

Curtis Lighting, Inc., has announced a new fluorescent unit with a steel top plate and plastic diffuser. Known as PlastiLux, the unit is designed for two 40-watt, 48 in. lamps per section and is primarily for use in offices, the manufacturer states. PlastiLux can be installed in continuous lines or individual units, mounted directly on the ceiling or suspended with Curtis hangers. Continuous PlastiLux is wired complete with 110-120-volt high power factor ballast, according to the manufacturer.

Sterling Insulating Varnish (618)

Sterling Varnish Co. has developed an insulating varnish for application to electrical apparatus which it claims will stand operating temperatures at 250°C, or higher. According to the manufacturer, the dried film is mechanically strong, exceptionally adhesive and flexible and retains these characteristics under adverse heat conditions. The new varnish is known as S-110.

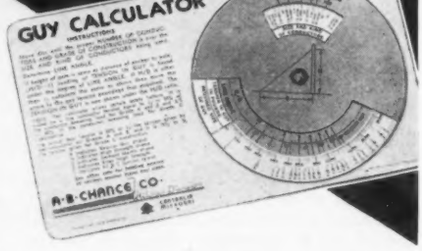
Mailway Banking
Solves Traffic Problems

If you want the many advantages of doing business with this bank, don't let traffic and parking problems influence you. Our Mailway service is the answer. Experience shows nine out of ten banking transactions are routine that you can handle more easily and cheaply by mail. Our Mailway envelopes and forms make this service especially convenient and safe.

Write for information today.

CROCKER FIRST NATIONAL BANK
OF SAN FRANCISCO
California's Oldest National Bank
Member Federal Deposit Insurance Corporation
ONE MONTGOMERY STREET

To make quick, practical anchor selections . . .

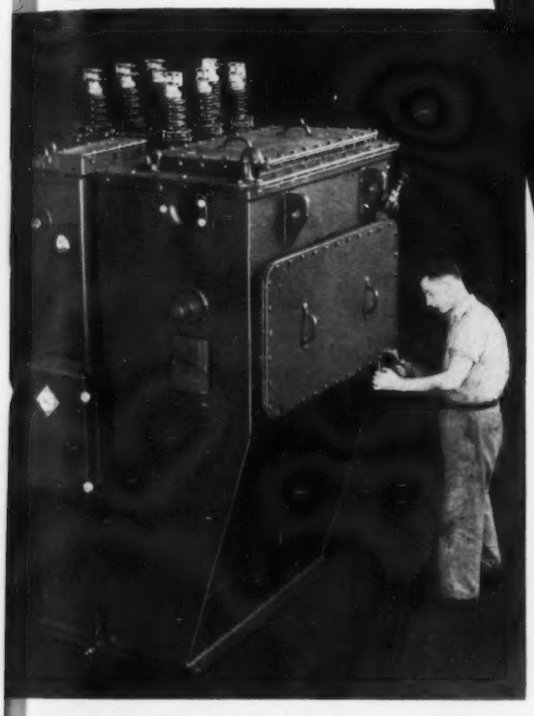


. . . use this CHANCE Guy Calculator

To get the most out of anchoring with the least amount of waste, each different problem should be carefully calculated, and with this new device such calculations require but a few seconds. It goes a step farther than similar calculators in that it shows at a glance just what anchors meet the requirements specified in the calculation. If you can put one of these calculators to work, send for it today—no charge, no obligation.

A·B·CHANCE CO. CENTRALIA MISSOURI

SAVED! COPPER AND MAN-HOURS FOR THE VICTORY EFFORT!



REQUIRING A MINIMUM OF COPPER AND man-hours, Allis-Chalmers 5/8% Step Regulators help keep production at capacity in the nation's industrial plants.

Allis-Chalmers 5/8% Step Regulators Raise Voltage on Overloaded Lines! . . . And Do It with a Big Saving in Man-Hours and Copper!

Have you, like many systems, had trouble maintaining voltage on overloaded lines? Here are facts that add up to real savings in two vital war materials — man-hours and copper!

This is what actually happened on a southern system, where, on a long run of light copper, rising loads had reduced the voltage below allowable limits. There were four possible ways to correct this condition . . .

1. Convert the delta system to wye. This required a fourth No. 4 copper wire, or 19,960 lb of copper.
2. Replace existing 13 miles of No. 4 with No. 00 copper wire. Crediting 26,190 lb of No. 4 wire, this meant an additional *47,160 lb of copper.*
3. Wire wrapping with No. 4 wire around 13 miles of existing conductors — *26,190 lb of copper.*
4. Installing a 120 kva, three-phase, 13,800 volt Allis-Chalmers 5/8% Step Regulator, requiring *only a few hundred pounds of copper.*

This southern system purchased the Allis-Chalmers Regulator. Not only did they conserve hard-to-get copper — they also reduced the number of man-hours required to make the change.

What's more, the regulator takes care of fluctuating source voltage and compensates for reactance as well as resistance drop. And, if the loads shift, the Allis-Chalmers AFR can be moved where it is needed.

Remember, you can accomplish savings of vital material with Allis-Chalmers 5/8% Step Regulators. And *only* with Allis-Chalmers Regulators can you get the five engineering advancements shown here!

For complete information, call the district office near you. Or write direct to Allis-Chalmers, Milwaukee, Wisconsin.

A 1504

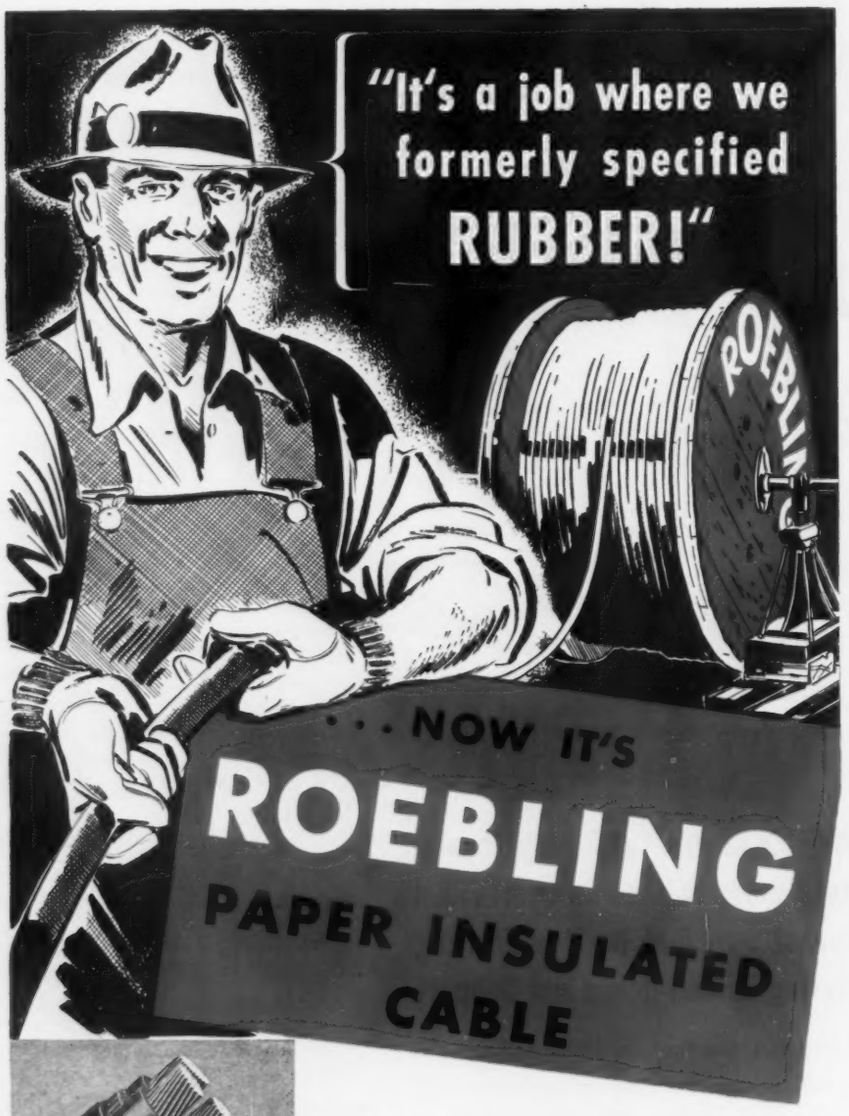
REASONS WHY ENGINEERS CHOOSE ALLIS-CHALMERS 5/8% STEP REGULATORS!

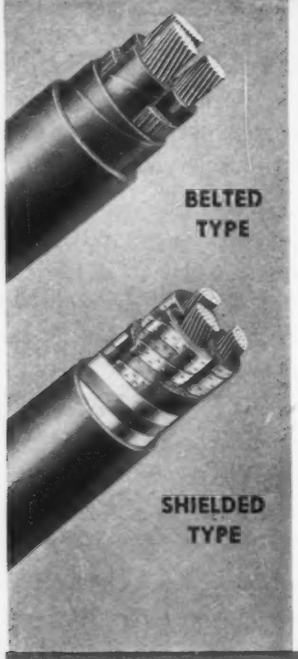
1. **Closer Regulation!** 5/8% half-cycling steps plus "Feather-Touch Control" permit band width settings within ±5/8 of 1%.
2. **Longer Contact Life!** Not a single contact has ever been replaced on an Allis-Chalmers Regulator due to deterioration under normal operation.
3. **Lower Exciting Current!** Need only 1/3 the exciting kva required by older types of regulators.
4. **Increased Dielectric Strength!** Unit construction eliminates 78 bolted connections between compartments.
5. **Minimum Maintenance!** No holding or braking devices. Complete oil-immersion of all moving parts means there's nothing to lubricate.

When On-the-Line Performance Counts... Count On

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN





● Yes, there are many applications today where Paper Insulated Cables are being used in place of rubber. And whether they're drawn into conduits, hung from messenger strand or buried directly in the ground, Roebling Paper Cables have records of performance which prove their reliability, operating efficiency and low cost.

Available in single and multiple conductor, in regular strand (round or sector) and Compack (round or sector). Made to purchaser's specifications and to meet the requirements of design, manufacture, tests and guarantees of the specifications for Impregnated Paper Insulated Lead Covered Cable, "Solid Type", Association of Edison Illuminating Companies. Excellent materials, fine workmanship, careful processing and thorough testing are assurance of satisfactory performance in service.

BELTED TYPE Cable may be used for phase to phase voltages up to 20kv.

SHIELDED TYPE Cable is particularly adaptable for three phase grounded neutral circuits from 13 to 35kv.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA
San Francisco • Los Angeles • Seattle • Portland

Lightning Protector (619)

Westinghouse Electric & Mfg. Co. has designed a new outdoor protector to guard against lightning damage to watthour meters and transformer secondaries. The unit has a cutoff line to ground rating of 500 volts rms. and is for application on 3-phase circuits of from 110 to 575 volts. Discharge capacity is 20,000 amps. crest and gap breakdown on impulse is 2,500 volts average. The unit is made up of porous block Autovalve elements and is enclosed in a wet-process porcelain casing to secure moisture-proof construction.

Watthour Meters (620)

A new line of switchboard watthour meters (known as Type CB) for industrial and central station use has been developed by Westinghouse Electric & Mfg. Co., and is available for metering all the various combinations of single phase or polyphase power. Mounting styles are flush, projection and a detachable or plug-in construction. The detachable models can be removed readily for overall inspection and test without interrupting the circuit, the manufacturer claims. All the calibration adjustments are accessible from the front when the molded glass covers are removed.

Fluorescent Lamp Holder (621)

Lloyd Products Co. has placed on the market a new "Narrow Channel" fluorescent lamp holder. It is made of a new plastic formula compounded by Lloyd engineers and, according to the manufacturer, giving greatly increased strength. Two styles are available—No. 172, designed primarily for use with T-8, 1-in.-diameter lamps in narrow channel reflectors, and No. 171 for use with 1-in., T-8 or 1½-in., T-12 lamps when mounted without

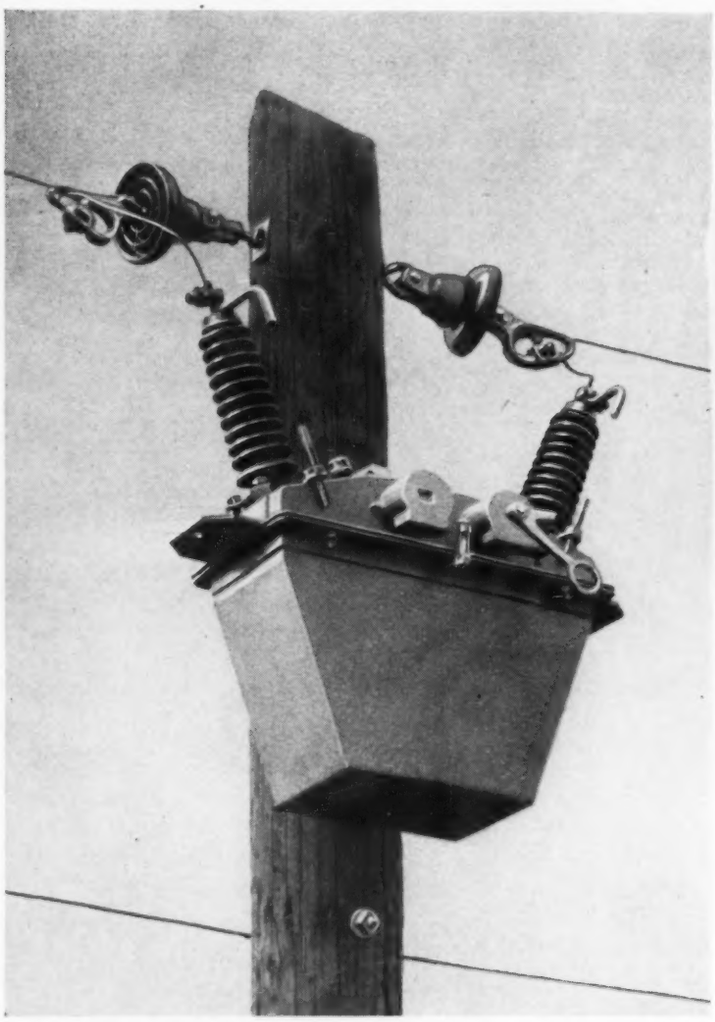
metal bracket. The units are push type and both lamp terminal pins are placed in the two slots. A slight push seats the lamp and locks terminal pins; the lamp is removed by a slight side pressure. Bronze contacts reinforced with spring steel insure perfect electrical contact plus absolute security, the manufacturer states, and neither vibration nor shock can loosen the lamp.

Safety Transformer (622)

A Safety Transformer providing for two 32-volt AC extension lines has been developed by the Acme Electric & Mfg. Co. The unit may be applied to furnish light for the workman under conditions in which explosive gases or vapors exist or where inflammable materials are stored or in process, and is adapted for inspection work where there is danger of contact with moist surfaces. According to the manufacturer the transformer may be easily carried about the plant and plugged into any ordinary 110-volt AC circuit.

80%* of RURAL OUTAGES

CAN BE PREVENTED WITH



PACIFIC ELECTRIC'S

SINGLE-POLE *Motor-Rewound Automatic* SERVICE RESTORER

For Rural Single-Phase Distribution Lines and Feeders

Type AE-1, 15-kv., 50-amps., 1000-amps. Interrupting Rating. Patent Pending.

Most of rural outages result from temporary faults which blow fuses.

This SINGLE-POLE Motor-Rewound Spring-Actuated Automatic Service Restorer will clear any number of transient faults and automatically restore service without delay! Locks out on sustained faults. Being easy to coordinate, with its consistent time and current adjustments, it isolates sustained faults. Devices without time and current adjustments are hard to coordinate, ofttimes cause outages to needlessly spread to large areas.

The Restorer is thoroughly tested. Has the Expulsion Chamber for fast arc extinguishment, is light in weight for low installation costs, has alternate manual operation, full enclosure and other safety and money-saving features. Get all facts on preventing most rural outages.

* Average preventable outages, as published in surveys, are those resulting from temporary faults which blow fuses.

EASY TO COORDINATE —wide range of trip coils for coordination with fuses and breakers.

LOWER MAINTENANCE —permits high-quality protection of low-cost systems.

RELIABLE, LOW COST —will clear immediately any number of transient faults; on sustained faults, offers 3 reclosures then lockout. Operating energy stored in a spring which is tripped to cause operation.

C. H. Cutter
1006 Securities Bldg.
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Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

BULLDOG BUSTRIBUTION DUCT AND TROL-E-DUCT

Plug in for Power and Light at any Desired Point

HERE is a splendid example of how parallel runs of BullDog BUStribution DUCT, *for power,* and Universal Trol-E-Duct, *for lighting,* take all the guesswork out of electrical distribution to specific production line locations.

Each machine is served with power through an individual protective plug — each light is separately fused, and instantly movable. Yet the whole line, including the BullDog equipment, can be rearranged or moved altogether with a minimum of lost time and maintenance cost.

Conversion from peace to war manufacturing, from one armament job to another, or back to peacetime manufacturing later on — all are equally quick and easy with the completely flexible, 100% salvable, prefabricated BullDog equipment.

BullDog pioneered Bus Duct Systems—and sets the pace for the field. Its engineering laboratory leads the way in improvements to increase efficiency and conserve critical materials, such as rubber, aluminum, etc.

To save time, why not let the BullDog Field Engineering Staff — men who have had years of experience in this field — submit complete electrical distribution layouts to your architect or your engineering department. Write today for complete descriptive bulletins.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS of Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER

WAR PRODUCTION PLANTS

Use S & C High Voltage POWER FUSES

Prompt Delivery

WITHIN the past year S & C Type "SM" Fuses were selected for dozens of large ordnance works and other war production plants. They provide power system protection at low initial and maintenance costs,—and deliveries can be made promptly.

Fuse ratings are from 1 to 400 amperes with short-circuit interrupting ratings up to 1,000,000 KVA. Installation is less costly, too, than for larger types of circuit-interrupting equipment.

S & C Type "SM" Fuses are made for Indoor or Outdoor service for use on 2300/4000, 6600, 13,200, 22,000, 33,000 volt circuits. Servicing is easily accomplished *on the job* by replacement of the Refill Fuse Unit.

SHORT CIRCUIT-INTERRUPTING RATINGS IN R. M. S. AMPERES

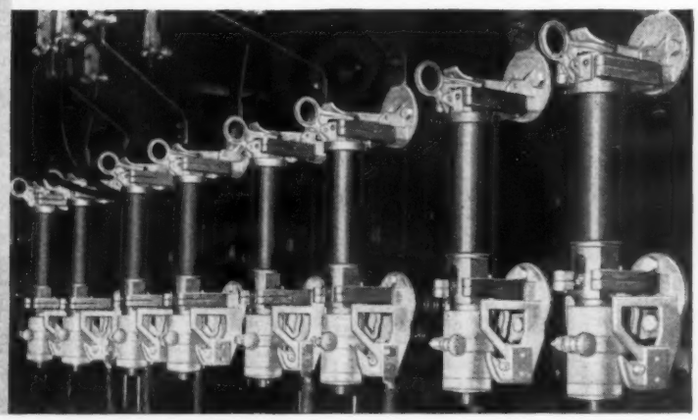
Fuse Voltage Rating →		7,500	7,500	15,000	23,000	34,500
Circuit Voltage →		2,300/4,000	6,600	13,200	22,000	33,000
Type and Size of Holder	**SMPC-4	17,500	15,000	12,500	10,000	7,500
	SMP-4	27,500	25,000	20,000	15,000	10,000
	**SMPC 5	30,000	25,000	20,000	17,500	15,000
	SMP-5	40,000	35,000	30.000	25,000	20,000

**Equipped with Condenser

Refer to your Bulletin 200-E or write for a copy

SCHWEITZER & CONRAD, Inc.
4435 Ravenswood Avenue Chicago, Illinois

TYPE "SM" POWER FUSES



WESTERN REPRESENTATIVES:

SAN FRANCISCO
George E. Honn, 420 Market Street

SEATTLE
T. S. Wood, 220 Ninth Avenue, North

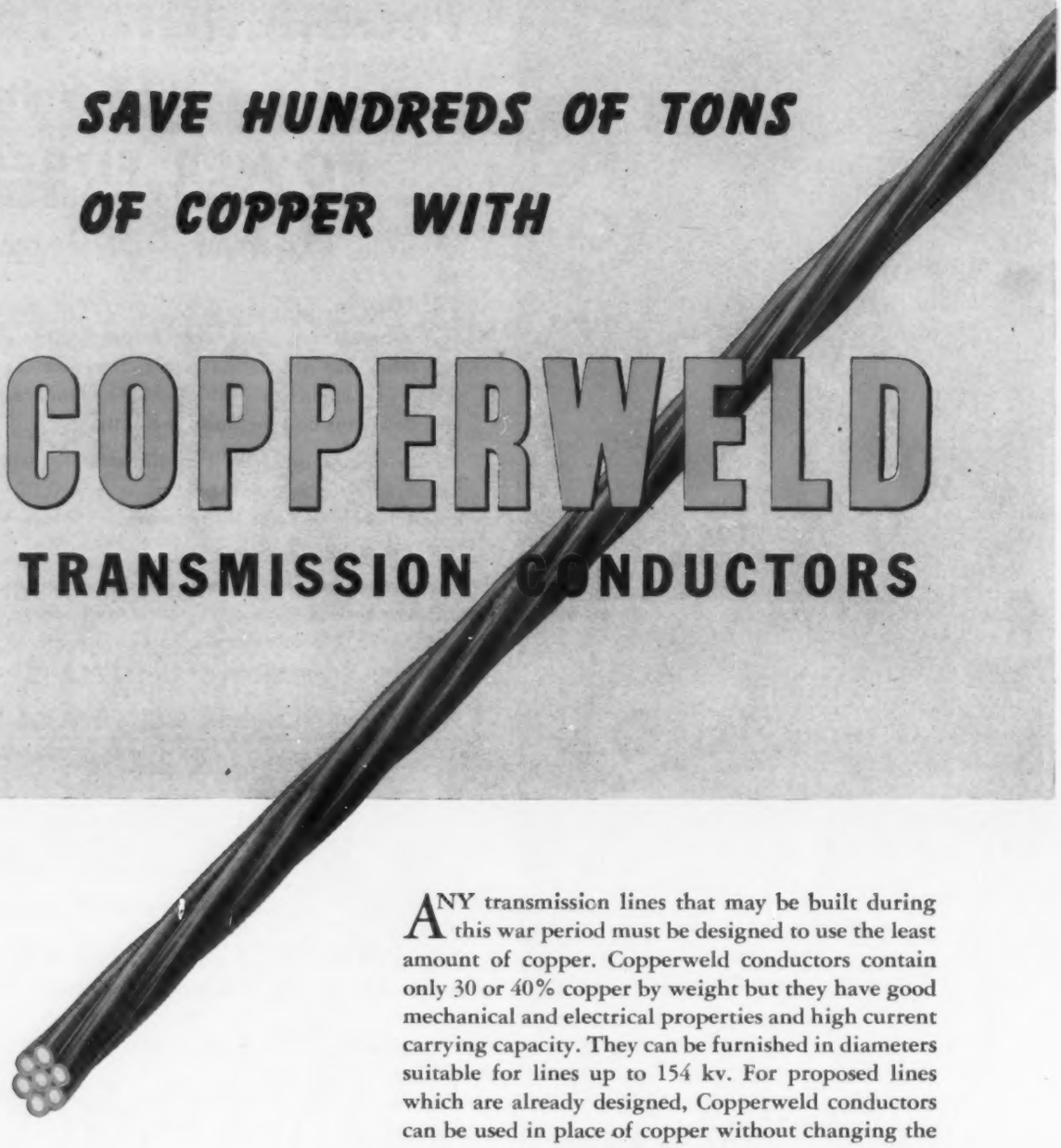
LOS ANGELES
Farnham & Cunningham, Edison Bldg.

SALT LAKE CITY
Riter Engineering Co., Kearns Bldg.

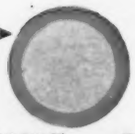
SAVE HUNDREDS OF TONS OF COPPER WITH

COPPERWELD

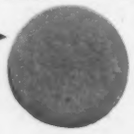
TRANSMISSION CONDUCTORS



ANY transmission lines that may be built during this war period must be designed to use the least amount of copper. Copperweld conductors contain only 30 or 40% copper by weight but they have good mechanical and electrical properties and high current carrying capacity. They can be furnished in diameters suitable for lines up to 154 kv. For proposed lines which are already designed, Copperweld conductors can be used in place of copper without changing the mechanical design of the line. Resistances and reactances are of the same order as copper conductors having an equivalent amount of copper. Copperweld conductors have good current carrying capacity and can be subjected to high temperatures without loss of strength or annealing. Their diameter is large in proportion to the copper content and this is very helpful in reducing corona loss.



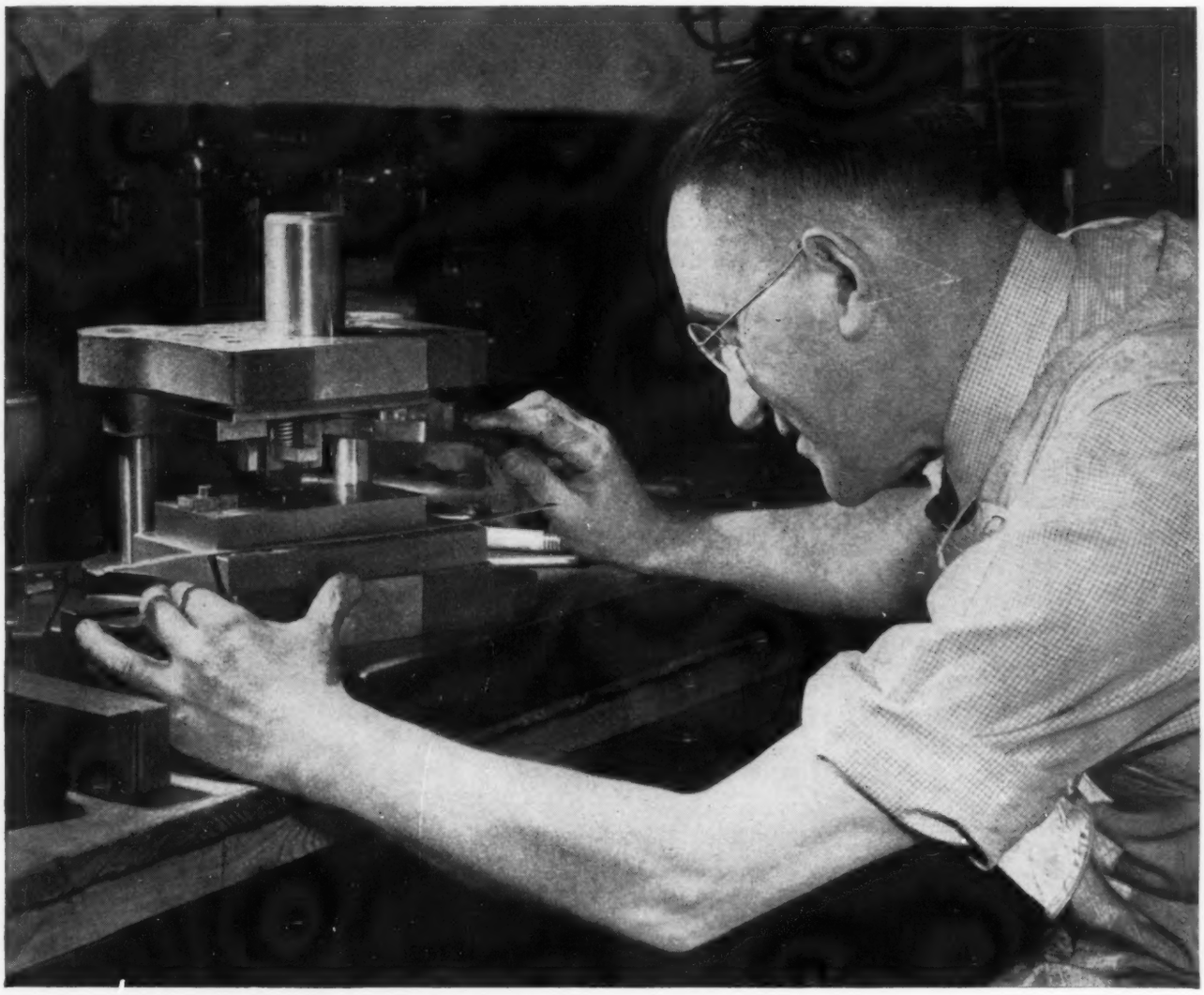
USE COPPER WISELY · DO NOT WASTE



Pacific Coast Representative: **C. E. INGALLS · Rialto Building · San Francisco, California**

COPPERWELD STEEL COMPANY

GLASSPORT, PA.



How Fred Bueschel came out of the dark!

FRED BUESCHEL makes dies in his own small die shop . . . one of thousands of shops producing vital war work on sub-contract. In die making where he frequently has to measure work to one ten-thousandth of an inch, he finds that fluorescent lighting is particularly helpful in following the pattern scratched on the metal before cutting. This line is so faint that it is practically invisible in poor or glaring light but is very visible under fluorescent lighting. His eyes used to get tired under the old light, but he is not bothered anymore. He says, "*It was just like coming out of the dark!*" Fred Bueschel's experience and thousands more like his should be told to every war plant in the country . . . especially smaller sub-contractors who urgently need better light to speed war production.

To assist in telling this important story of war production lighting to every large and small shop in the country, General Electric has prepared a comprehensive plan including a plan book, training material, a booklet on war production lighting, and a lighting salesman's handbook. The latter includes "before and after" photos illustrating 24 lighting bottlenecks and how to break them. Your General Electric lamp division has complete details on this plan and will be glad to discuss them with you.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Light

RATES A HIGH PRIORITY

SEE OUR CATALOG IN SWEET'S

A SINGLE basic wiring and lighting system completes practically any type of Fluorescent installation . . . single or multiple units or continuous Line-O-Lamps runs . . . with or without reflectors or with glass enclosures.

● Not merely better light, but light four or five times as good . . . clean, cool daylight that enables workers to work faster with less fatigue and less spoilage.

That is why you now see war plants brilliant with fluorescent lighting all through the night. That kind of work light rates a high priority.

You can install it in YOUR plant . . very easily, at low cost and without disrupting work schedules . . . by using the Wiremold "3000" System.

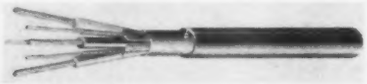
FLUORESCENT LIGHTING by WIREMOLD

STEP UP LIGHTING to SPEED UP PRODUCTION

THE WIREMOLD COMPANY, HARTFORD, CONN.

Flamenol Bus-Drop Cable (623)

General Electric Co., Wire and Cable Division, has announced a new nonrubber flexible Flamenol bus-drop cable for 600-volt branch circuits. Advantages claimed for it by the manufacturer are that connection can be made from bus to machine at a saving in installation time and materials and that it requires no conduit, thus saving steel as well as rubber. According to the manufacturer, this nonrubber bus-drop cable is actually better than rubber cable because it is highly resistant to oils and coolants and will not support flame. It is easy to handle, easy to bend and is resistant to abrasion, the manufacturer claims.



One end of the cable is inserted into a knockout of the plug-in box of the bus system by using a conventional squeeze-type fitting. The cable is then run horizontally to a point above the machine. Here the cable is looped through, and is supported by, a porcelain spool insulator connected by a spring to a supporting wire. The cable then drops, to terminate at the switch box of the machine tool.

Air Raid Siren (624)

Breuer Electric Mfg. Co. is manufacturing an air raid siren for use inside the plant or office building. Two models are available—one for small departments or rooms and a larger one for manufacturing areas. They are equipped with Universal motors for either AC or DC operation; operate from ordinary light current; equipped with base for vertical or horizontal mounting.

Adhesive Sticker (625)

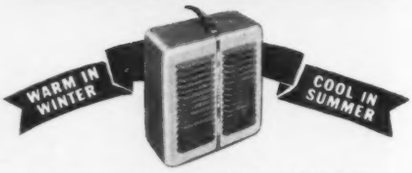
Avery Adhesives is manufacturing a new-type sticker to identify wires for installations and to carry instructions, warnings, patent numbers and identification. They are applied without moistening and, according to the manufacturer, adhere permanently to any smooth surface yet may be pulled off easily without leaving a mark. Available blank or printed to specification.

Insulation Tester (626)

Superior Instruments Co. has announced a new model insulation and breakdown tester featuring a super sensitive danger indicator, which automatically glows to indicate leakages up to 1,000 megohm. The new unit

instantly shows up "shorts" and "opens," according to the manufacturer. Other advantages claimed for the device are (1) no hand cranking; (2) no batteries to adjust; (3) no adjustments to make. Supplies four voltages—250, 500, 1,000 and 1,500.

KEEP 'EM COMFORTABLE



FOR INCREASED PLANT EFFICIENCY

PORTABLE ELECTRIC HEATERS

Watch production soar when you install Thermador Portable Electric Heaters. Enclosed fan forces out warmth or circulates cooling air. Light, compact, portable, may be moved about plant or office.

Equipped with four-position switch: cool, half heat, full heat, off. 8 feet cord, polarity plug. 230 Volts—50 or 60 cycles A.C., Single Phase. Sizes to 5000 Watts. Write for details.

THERMADOR

5119 SO. RIVERSIDE DRIVE, LOS ANGELES, CALIF.
230 MADISON STREET, OAKLAND, CALIFORNIA

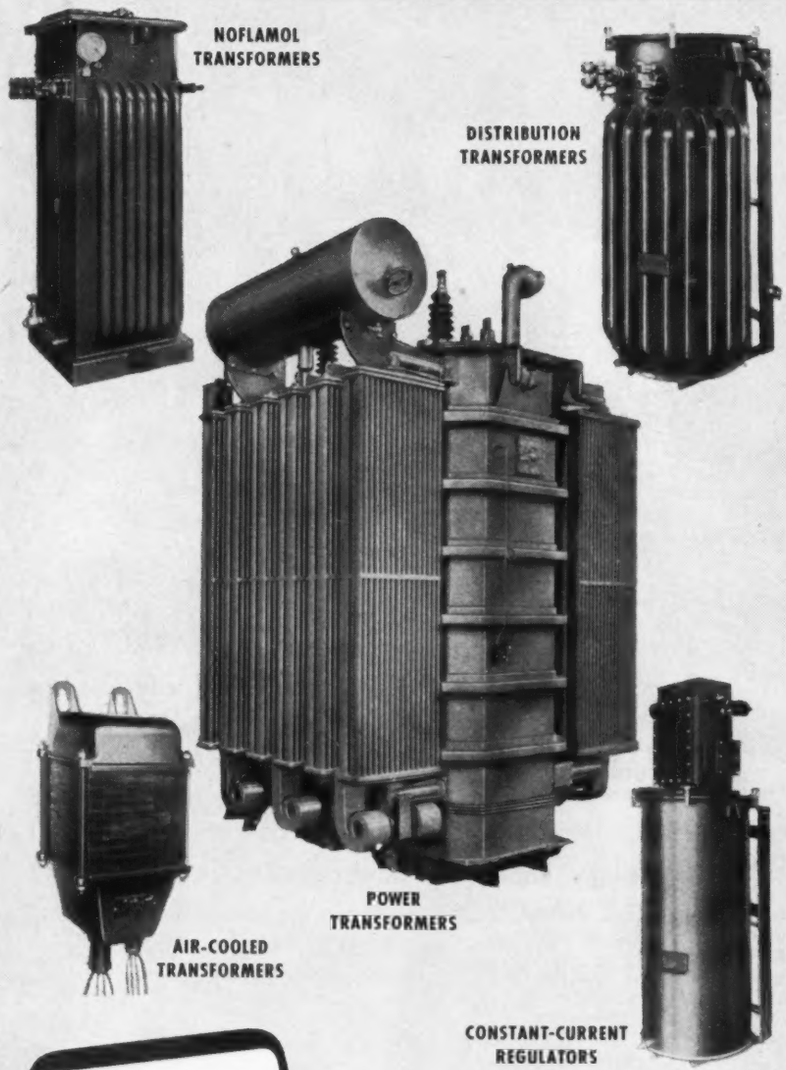
EVERSTICK ANCHORS...

FOR SPEED IN INSTALLATION

The exclusive Everstick nut housing locks the Anchor firmly on the rod. This speeds up installation. Plates are so designed, that they expand easily into undisturbed earth, and extra holding power is achieved. Made of tough, rust-resistant malleable iron. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

WAGNER TRANSFORMERS STAY ON THE JOB IN WAR TIME...as in peace time!



Wherever the use of dependable electric power and light is of vital importance, Wagner Transformers are doing their part in speeding up our war program—in industries producing victory material, electric light and power plants, government construction projects, airports, army cantonments, warships and merchantmen.

Wagner transformers, during many years of service to industry, have proved their ability to furnish unfailing power, and it is only natural that they should be selected for the key points of power distribution in this time of war.

Wagner builds all types and sizes of power and distribution transformers stud-bushing type; primary-pocket-stud type; sub-station and subway types; single- or three-phase; rural-line; air-cooled; Noflamol; and Type Y-H Constant-Current Regulator.

Because of large plant capacity, modern manufacturing facilities, and years of engineering and manufacturing experience, Wagner can give immediate attention to all your transformer requirements.

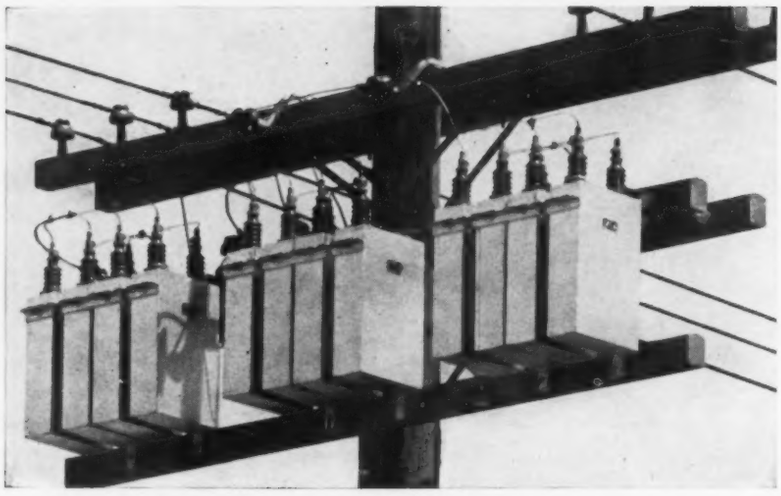
COMPLETE LITERATURE WILL BE SENT ON REQUEST

Bulletins TU-180 (distribution) and TU-181 (power), illustrate and describe the complete line of Wagner Transformers. They will be sent FREE. Write for copies today.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.
TRANSFORMERS · MOTORS · BRAKES · FANS

T42-5

FAST CAPACITORS



180 Kva, 2400 Volt Pole Type Installation

Power factor correction with static CAPACITORS has often proved to be the economical way to raise the voltage level and increase the load carrying capacity of a distribution system.

Now that speed and material conservation are increasingly important, power factor correction with FAST CAPACITORS is more popular than ever.

FAST CAPACITORS are easy to install.

JOHN E. FAST & CO.

CAPACITOR SPECIALISTS FOR 22 YEARS

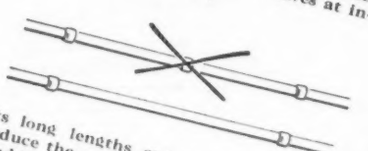
3123 NORTH CRAWFORD AVENUE **CHICAGO, ILLINOIS**

West Coast Representatives: WALTHAM, DeWITT & KRUSI, 630 Monadnock Bldg., San Francisco, California. Farnham and Cunningham, 628 Edison Bldg., Los Angeles, California. Maydwell & Hartzell, 1233 N.W. 12th Ave., Portland, Oregon.

WHAT'S THE DIFFERENCE BETWEEN TRANSITE *CONDUIT* and TRANSITE *KORDUCT*?

TRANSITE KORDUCT

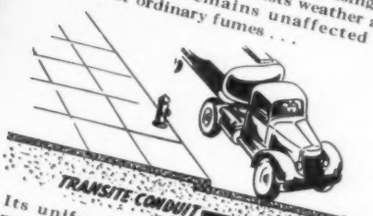
is ideal for locations where ducts must be "concreted in." It is identical with Transite Conduit, except that it is thinner walled and lower priced. It saves at installation because . . .



its long lengths cut down on joints, reduce the number of spacers required. And its high rate of heat dissipation cuts cable operating temperatures . . . increases system capacity.

TRANSITE CONDUIT

is for use underground or on exposed locations without a concrete casing. It can't rust or rot . . . resists weather and corrosion . . . remains unaffected by smoke or ordinary fumes . . .



Its uniform strength and durability mean that it holds its true form under earth loads and traffic pressure. And it is low in cost . . . more economical in service than other materials of comparable strength and corrosion-resistance.

And here are characteristics that Transite Conduit and Transite Korduct have in common . . .

1. Incombustible . . . Made of asbestos and cement, Transite Ducts won't contribute to the formation of dangerous smoke, gases or fumes. When burnouts occur, they give maximum protection to adjacent cables and equipment.

2. Immune to Electrolysis . . . Transite Ducts are entirely inorganic, non-metallic, cannot be affected by electrolysis.

3. Smooth bore . . . Cable pulls and replacements are easier . . . damage to sheathings is minimized.

4. Easily installed . . . Their combination of light weight, long lengths and quickly assembled couplings speeds up work.

For details and specifications, write for Data Book DS-410. Johns-Manville at Los Angeles, San Francisco or Seattle.

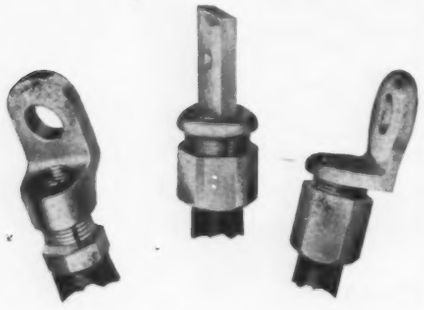
JM Johns-Manville

TRANSITE DUCTS

TRANSITE KORDUCT— for installation in concrete

TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement

Small, Large, Fat, Thin, Male or Female - In the "Gorilla Grip" family there is a precision made fitting for every size conductor, no matter where it taps or terminates.



Lugs, Connectors and Taps are available for sizes 14 to 2,000 MCM. Each terminal unit machined for just one size wire. However, one terminal unit will fit many types of Lug, Connector and Tap bodies.

No special tools are required for any "Gorilla Grip" installation. Try "Gorilla Grips" and see how easy they are to install and how perfect a "grip" is obtained.

National Electric
PRODUCTS CORPORATION
1300 Fulton Bldg. Pittsburgh, Pa.

BULLETINS

data books, etc.

Induction Motors (627)

Application of induction motors to power station auxiliaries is treated in an illustrated 22-page bulletin issued by General Electric Co. Information is given on selection of motors for such power station applications as induced- and forced-draft fans; boiler-feed pump drives; condensate and hot-well pumps; circulating pumps; service-water, de-aerator and evaporator pumps; coal pulverizers and other general applications. Construction features of the various motors are described and depicted and motor characteristics of typical applications are tabulated.

Resistors (628)

Data on standard fixed and variable resistors for defense and industrial requirements is incorporated in a chart being distributed by the International Resistance Co. Information includes wattage and voltage ratings; dimensions; maximum and minimum resistance values available; terminals; mountings; temperature rise; variations with time, tolerances, maximum operating temperatures; temperature coefficients; inductive characteristics.

Coronol (629)

Coronol, a cable insulated with a G-E oil-base compound, is the subject of a folder prepared by General Electric Co. This cable, which is said to have high resistance to ozone, is recommended by the manufacturer for practically all cases where a long-lived, high-voltage, rubber cable is desired.

Portable Substations (630)

Trailer mounted portable substations in all voltage ratings up to 69 kv. and in capacities up to 4,500 kva. are discussed in a new bulletin prepared by Westinghouse Electric & Mfg. Co. Illustrated.

Demand Meters (631)

H D Electric Co. describes its Max-I-Meter, Max-I-Tran and Lincoln Graphic Demand Meter for checking maximum demands on electrical equipment in a new six-page pamphlet. Price list included.

Air-Cooled Transformers (632)

General Electric Co. describes its line of Air Cooled Transformers for use on circuits of 600-volts and above in a new eight-page bulletin. Attention is directed in the booklet to details of construction and the care in selection and application of materials used in the equipment.

Switchgear Equipment (633)

Metal-enclosed switchgear equipment is described in a booklet prepared by General Electric Co. Typical installations are described and illustrated. Diagrams show typical floor arrangements. The equipment is completely factory-assembled.

Lightning Arresters (634)

A 16-page booklet announced by Westinghouse Electric & Mfg. Co. describes line-type lightning arresters for transmission lines of from 20 to 73 kv. or small substations of 1,000 kva. and less. Application to grounded and ungrounded neutral systems is discussed with recommendations for typical installations; performance characteristics are tabulated giving values of voltage rating, 60-cycle breakdown, impulse breakdown and discharge voltage. Illustrated with charts and photographs.

Consumer Booklet (635)

A consumer booklet, "The Care and Use of Electrical Appliances in the Home", to be distributed by Westinghouse appliance dealers, is announced by Westinghouse Mfg. Co. This 32-page illustrated booklet includes hints on economic use and proper care of appliances; household suggestions for food buying, menu planning and short cutting household tasks. All Westinghouse appliances are listed and their most efficient operation methods explained. Details of correct home lighting with no electricity waste are given and a diagram of correct size bulbs for portable lamps is included.

Transformer Regulation (636)

Of interest to engineers is a transformer regulation "slide rule" being distributed by Allis-Chalmers Mfg. Co. Although designed primarily for calculating transformer regulation, this device can be used also for calculating the regulation of other electrical apparatus, according to the manufacturer.

Fluorescent Lighting (637)

Westinghouse booklets, Facts, Questions, Answers on Fluorescent Lighting, cover domestic, industrial and commercial installations. Aim of the manuals is to present in simple, non-technical language descriptions of the various applications. Fluorescent Lighting in the Home (D) gives reference data on bulb construction, auxiliary devices, sizes and colors of fluorescent bulbs; advantages; questions and answers on construction, operation, costs and use; do's and don'ts. Fluorescent Lighting in Stores, Offices and Public Buildings (C) includes information on the lamp; ballast and starter; selecting fixtures; application; cost comparison; questions and answers on various applications. Fluorescent Lighting in Industry (I) was covered previously.

Nonmetallic Gears (638)

Giving the story of nonmetallic gears, a new booklet, "Silent Gears", has been published by General Electric Co., plastic division. Two types of nonmetallic gear materials — Fabroil and Textolite—are described. Included are suggestions for machining; installation data; load and gear specifications; dimensions of gear banks; information for ordering.

Fly Ash Elimination (639)

Elimination of fly ash from boiler flue gases is the subject of a booklet published by Western Precipitation Corp., describing the 9 VF. Multiclone, a mechanical separator. The booklet contains information on the collection of fly ash, with graphs, diagrams, tables of collection efficiencies, methods of preliminary testing and suggestions on procedure.

Expand with UNIT SUBSTATIONS

Slide the factory-assembled sections into position, make the necessary connections, and your unit substation is ready for service.

Your best bet for supplying fast-growing loads

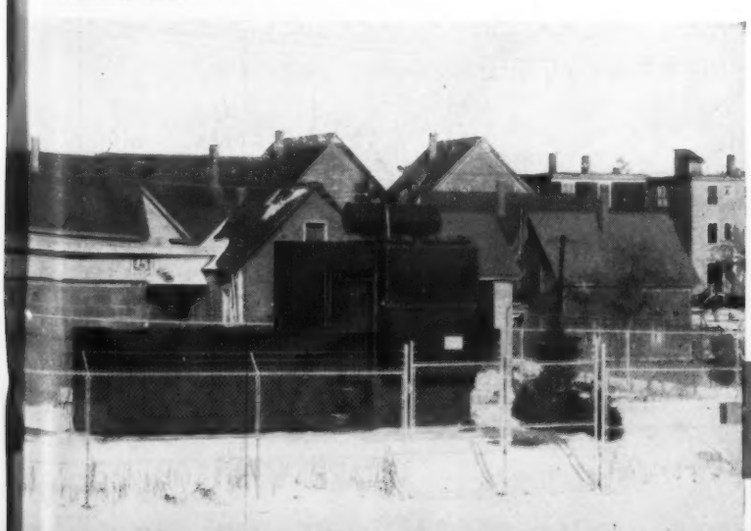
SAVE
Time, Space, Material

Their neat, attractive appearance makes G-E unit substations readily acceptable even in residential areas.

PROPERLY co-ordinated, factory-built unit substations—one solution of your vital problem of supplying today's rapidly growing loads. They're easily and quickly installed—in days rather than weeks—with a considerable saving in important materials. ***They're easily moved when load centers change;*** you'll never have large blocks of capital tied up in idle substation equipment that you provided for future growth. Engineering and planning time are sharply reduced; you purchase the substation as a "package," from a single manufacturer, with a simple functional specification.

Compactly designed for outdoor service, unit substations make large investments in real estate and buildings unnecessary. And you can locate them ***close to load centers*** so secondary feeders are shorter (saving tons of vital copper), losses are lower, service better.

Add up these advantages. We think you'll agree: for the changing power requirements of today *and* tomorrow, unit substations offer the practical, far-sighted answer. Ask your local G-E representative for more information—or write direct for descriptive literature. *General Electric, Schenectady, N. Y.*

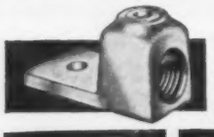


General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

SAVE TIME—select your conductor fittings from this Catalog . . **ALL** good types

You can buy Tee Connectors, Grounding Clamps, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Service Connectors, Bus Supports, Terminals . . . *practically every good type, in the COMPLETE line.*



JUST FOR EXAMPLE— here are some of the standard Penn-Union Vitite terminal lugs:

2-bolt flange

45° flange

Side flange

Center tongue

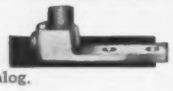
Round, 45°

Round, 90°

Round, offset

Round, center

These types and many more—in a *complete* range of sizes. Write for Catalog.



KENNETH ANDERSON CO.
334 East 4th St., Los Angeles

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington

F. M. NICHOLAS CO.
1123 Harrison St., San Francisco

Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

Oil Circuit Breakers (640)

A new catalogue has been released by Roller-Smith Co., describing small oil circuit breakers for use on alternating current circuits in industrial plants and power houses where interrupting capacities of 50,000 kva. are required. The 12-page booklet discusses various methods of tripping, describes attachments available, gives the characteristics of each size of breaker, and shows dimensions and typical control diagrams.

Productive Lighting (641)

A manual entitled "Benjamin Specifications for Productive Lighting in War Plants" has been issued by Benjamin Electric Mfg. Co., giving data useful in solving problems of production, rejects, employee fatigue, morale, etc. Main section is devoted to solutions for 21 lighting problems commonly encountered in plants converting to war production. Both fluorescent and incandescent lighting covered. Selection of proper lighting equipment, how to get the most out of present lighting system, and how to conserve lamp life and electric power are among the subjects treated. Illustrated.

Wiring Devices (642)

Pass & Seymour, Inc., has issued a new catalogue of wiring devices, revising its product listing for greater convenience. For use with the 76-page catalogue is a loose-leaf wiring device index and list price sheet and priority supplement.

Busduct Equipment (643)

Busduct light and power distribution equipment for industrial plants is described by the Frank Adam Electric Co. in a 20-page bulletin released recently. Covered are Feeder Busduct, Plugin Busduct and Plugin devices and accessories.

Wire Data Chart (644)

A wire data chart has been prepared by Callite Tungsten Corp. for distribution to engineers. Included are: the B & S, Washburn & Moen and Stubs or Birmingham diameters for gauge sizes 1 to 50; on B & S column ft./lb. for each size of standard 5% phosphor bronze; a table of conversion factors for use in obtaining the ft./lb. values for 15 other common wire materials; a tabulation giving for each of the 15 details of (1) nominal analysis composition, (2) approximate tensile strength for hard and soft grades in lbs. per in., (3) approximate percentage of elongation for hard and soft, (4) density in lbs. per cu. in.

Outdoor Type Switches (645)

An illustrated booklet has been published by Delta-Star Electric Co. describing single horizontal break "PMB-236" pole top and substation group operated outdoor type switches. Complete dimensions are given for voltages from 7.5 to 138-S/161 kv. switches in capacities from 400 to 1,200 amp. Contacts are of the multi-finger high-pressure button type; blades are of the two-section design with knee-break contact section.

Westinghouse "Slide Rule" (646)

Westinghouse Electric & Mfg. Co. is issuing a pocket size "slide rule" selector as a guide to the proper type of motor for each of 44 industrial applications. A table lists the various uses and indicates which of the four principal types of AC motor should be selected; specifications, performance ratings and control classes for the required type determined by making the corresponding setting on the slide.

Connectors (647)

A folder issued recently by Ideal Commutator Dresser Co. describes Wirenuts, solderless, tapeless wire connectors. Another recent release is entitled "8 Ways to Speed Up Production" and covers Ideal "Triple-Duty" Live Center, electric etchers, electric marker, balancing ways, grinding wheel dresser, "3-in-1" cleaners, demagnetizer and washer punch.

Tachometer (648)

James G. Biddle Co. recently issued a folder describing the Jones Heavy Duty Hand Tachometer, an indicating instrument for measuring speed directly in rpm. or fpm. Price list included.

Dunmore Motors (649)

A 24-page catalogue describing its complete line of fractional horsepower universal (series) motors has been released by the Dumore Co.

ELECTRICAL WEST, 68 Post St., San Francisco, California.

Please send me the following CIRCLED items:

600	601	602	603	604	605	606	607	608	609
610	611	612	613	614	615	616	617	618	619
620	621	622	623	624	625	626	627	628	629
630	631	632	633	634	635	636	637	638	639
640	641	642	643	644	645	646	647	648	649

Name . . . . . Company* . . . . . Title* . . . . .

Address . . . . . .

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

This advertisement also appeared in:
NEW YORK TIMES
CLEVELAND PLAIN DEALER
CHICAGO DAILY NEWS
DETROIT FREE PRESS
WASHINGTON POST

You Expected to Read This NEXT YEAR!

Industry after industry is beating its promise as America's war production sets new world's records . . . Management, labor, W. P. B., Army, Navy, the Maritime Commission and other government departments are cooperating to make next year's headlines come true THIS year.

In World War I, the Kaiser feared American manpower. In World War II, Hitler is even more fearful of our rapid transition from peace to war production. . . . He has reason to be afraid.

Printing press factories are exceeding quotas on anti-aircraft gun parts.

Spark plug manufacturers are setting new speed records in machine gun production.

The heavy-transportation industry is making giant chassis for big guns at a faster rate than all the Axis powers combined.

In this industry, men who used to make locomotives and tractors are changing "Too Little and too Late" to read "Too Much and too Soon," from the enemy's viewpoint.

Starting just a few months ago, with a bale of blueprints and a knowledge of how to build such things as road-scrapers, power-shovels and trucks, the heavy-transportation industry is turning out mobile artillery that will shake the earth in more than a literal sense.

• • •

The story of how this industry joined the army carries a significance which should be understood and remembered.

The significance is that America has solved the problem of exchanging production techniques between specialized industries. This process went on unnoticed in peacetime. War gave it prominence.

OVER

▶When the bales of blueprints were first delivered, and the heavy-transportation industry started on its job of producing prime-movers and chassis for big guns in quantity, new production techniques were needed in a hurry.

▶Here are some of the questions that arose:

"How do you weld such heavy sub-assemblies?"

"What welding fixtures will handle these parts so that our workmen can always weld down-hand?"

"How can we make these long, heavy welds and have sound metal from one end to the other?"

"What's the best technique for testing welded parts? Shall we x-ray, or use the magnaflux process?"

"What's the best way to support these welded assemblies for machining?"

That's just a few of the thousands of questions that arose in the minds of experienced men when they had to solve new problems.

They illustrate the fact that American production methods depend upon specialized techniques and machines.

Each man with such a problem knew that someone, somewhere, had solved his problem, or might solve it before he could work out his own answer.

Therefore he turned to the source of industrial information he had always used when he wanted to know what others were doing . . . his industrial magazine.

Ever since the Maginot Line was flanked, the Industrial Press of America has been helping rookie industries to become veterans in the battle of war production.

▶It doesn't do this by exhortation or command, but by answering thousands of specific questions.

Just as newspapers keep their war correspondents at the front, Industrial Magazines keep their "war-production-correspondents" in the plants where weapons and equipment are made. McGraw-Hill editors are mobilized for war as literally as though they were firing weapons instead of helping to produce them. More than 90% of the time of McGraw-Hill's 153 editors and 725 engineer-correspondents is devoted either to visiting war-production plants (to study production techniques) or in writing "war stories" on how production problems were solved.

"Know-how" is the secret of the amazing records now being made by American Industry. And "know-how" comes from thousands of "little facts" like this:

Information on tool shapes for cutting the harder steels of war is vital literature to the engineer, designer or production man with the particular problem of cutting those steels confronting him.

The industrial editor does not work alone in giving vital information to men on the production line. In much the same way, manufacturers are war-converting their industrial advertising to show their readers how to use their products more effectively. For instance:

A business-paper advertisement showing how to make old taps and dies last longer has no glamour for anyone but the man who must rush production with an inadequate supply of new ones. To him it has enough "oomph" to be clipped and placed on his office wall.

To the casual observer, the Industrial Press is about as exciting as the rows of wires that stretch along every road and railway. . . . The simile is very apt. Both exist solely for the interchange of ideas. Both are typically American in the extent to which they have been developed and applied to the whole economy. . . . *This advertisement published by the McGraw-Hill Network of Industrial Communication.*

• • •

THE McGRAW-HILL NETWORK

23 PUBLICATIONS WHICH HELP MORE THAN 1,000,000 EXECUTIVES, DESIGNERS AND PRODUCTION MEN TO EXCHANGE IDEAS ON WAR-PRODUCTION PROBLEMS

American Machinist • Aviation • Bus Transportation • Business Week • Chemical & Metallurgical Engineering • Coal Age • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Transit Journal • Wholesaler's Salesman. Also publishers of thousands of books for technical and engineering schools and colleges, as well as for general business use.

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET, NEW YORK

Neighborly G-E WIRING MATERIALS DISTRIBUTORS

Offer Wiring Supplies Needed for War Work

G-E Wiring Materials Distributors are in a position to serve you well. One of them is located right in your own territory, ready to give you neighborly service. Wiring materials needed in wartime are needed in a hurry.

Ask a representative of your G-E Wiring Materials Distributor to call. He'll help you select suitable materials for wiring war housing . . . for wiring a new factory . . . for wiring any sort of project aiding the war effort. He'll work overtime to expedite deliveries.

The G-E line of conduits, boxes and fittings, wire and cables and wiring devices handled by your G-E Wiring Materials Distributor includes all of the materials you need. They are high quality materials, too, easy to work with and sure to give your customers dependable service.

W. E. Staves (left), owner of the Electrical Shop, Missoula, Mont., is showing the wiring installed in Missoula County High School's new addition, to C. G. Evans, salesman, General Electric Supply Corporation, Butte, Mont., and is complimenting him on the good service his house gave.

G. L. Gruenwald (left), branch manager, General Electric Supply Corporation, Wichita, Kan., is here checking specifications and blueprints with R. M. Sutton, South Western Electric Co., Wichita, to determine wiring materials required for new building.

C. F. Parker (left), Richmond, Ind., is checking on materials with C. A. Kleinkneckt (center), and A. E. Dailey, president and vice president respectively of the Richmond Electric Co., Inc., Richmond, Ind., needed for a rush job. F. C. Thompson, counter salesman, is on the ladder in rear obtaining samples of materials discussed.

G-E district representatives in all parts of the country help distributors serve customers. This is L. B. Johnson, who covers Montana, Idaho, Utah, Colorado, New Mexico and western South Dakota.

FOR G-E WIRING MATERIALS
Ask your G-E Wiring Materials Distributor about G-E conduit, boxes and fittings, wire and cable and wiring devices to fit your needs. General Electric Co., Appliance and Merchandise Department, Bridgeport, Conn.

GENERAL ELECTRIC

All out but never all in!
Reporting for Extra duty, N
Good Lighting cuts shopping time!
After Hours—time
We're All Doing DOUBLE DUTY, Now!
Learn to do Tricks with a Toaster!
Draft your waffle baker, to
Enlisting Electric Service for Victory
SAN DIEGO GAS & ELECTRIC COMPANY

EASY TO ASSEMBLE

METAL PARTS ON

ILLINOIS
POTHEAD PORCELAIN

☆ The top and bottom surfaces of ILLINOIS Pothead Porcelain are absolutely parallel. End surfaces are ground by special machinery when required.

Perfect assembly, so important to the pothead manufacturer, is assured—a feature which increases production efficiency.

Another step in the manufacture of ILLINOIS Pothead Porcelain is that of gaining exact dimensions—this is accomplished through profile control which makes possible uniform contour as well as accurate dimensions.

HIGH DIELECTRIC STRENGTH

HIGH MECHANICAL STRENGTH

EXACT DIMENSIONS AND UNIFORMITY

ILLINOIS ELECTRIC PORCELAIN CO. *Macomb, Illinois*

NEWS *the whole*

THE AUTHORIZED DEALER

WEEKS OF STUDY and discussion and organization have gone into this plan to help dealers weather the storm of restrictions and freezing orders, and also help appliance owners through a period when new appliances will be difficult or impossible to obtain. ✡ The plan calls for dealers who have the necessary equipment and personnel, or who can get them, to act as *factory-authorized repair and service headquarters,* while continuing to sell reconditioned appliances and such new things as may be on hand or available. ✡ The plan is everything that dealers have been asking for—tailor-made to fit appliances, replete with things to use and things to do, something in which all branches of the industry can work together and help each other. ✡ To name a few of the manufacturer and wholesaler contributions, there will be service manuals and periodic service bulletins, helpful proced-

industry has been waiting for-

SERVICE and REPAIR PLAN!

ures for training repairmen, assistance in getting tools and parts, advice in working out fair and reasonable price schedules for repair jobs and overhauls, and so on. ✡ The P. G. & E., on the other hand, will provide the advertising and promotional help to carry the story to the public and impress on Mr. and Mrs. Homemaker the need for keeping on top of repair problems rather than waiting for something serious—and expensive—to happen. This will be done via newspapers, billboards and radio, and will begin immediately! ✡ The bulletin officially announcing this program and carrying all the details should reach you soon. In it you will find the campaign slogan, "DURATION-IZE *your appliances with timely repair. A wartime necessity!*" We feel sure that as people come to appreciate the truth behind this slogan, dealers with a really top-notch repair service to offer will have all the work they can do.

P·G·and·E
PACIFIC GAS AND ELECTRIC CO.

BUY WAR BONDS AND STAMPS REGULARLY

★ ★ ★ ★ ★

WE ARE PROUD

Many of our members have left their civilian pursuits to serve in the armed forces. They are in all branches of the service—wherever their calls have bid them go. Of them we are very proud—and to them we send greetings and best wishes for the speedy completion of their great undertaking.

But we are also proud of those members who are still on the job of keeping the wheels of industry turning at an ever-increasing speed. And these are the members whom we can best serve during the present emergency. The war has introduced many problems into everyone's work—new problems for which there is no background of experience. Serious mistakes and the loss of valuable man-hours can be avoided only through the exchange of ideas, so use your Association as the clearing-house for getting in contact with others who are struggling with the same problems as yourself.

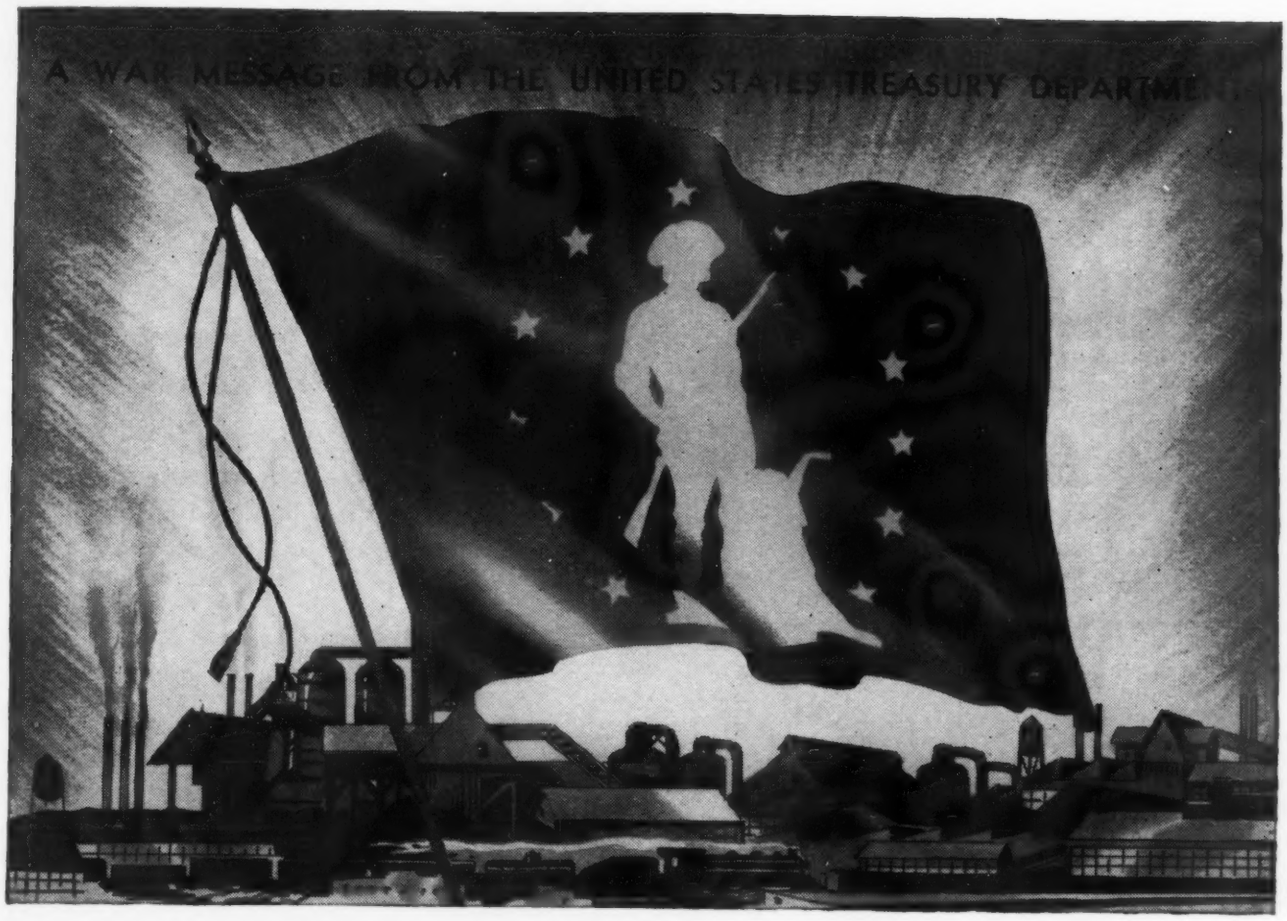
We are proud of our members—service men and civilians alike—and we are proud of our opportunity to render our members an assistance that is more urgently needed than ever before.

PACIFIC COAST ELECTRICAL ASSOCIATION, INC.

601 W. Fifth Street
Los Angeles

447 Sutter Street
San Francisco

★ ★ ★ ★ ★



Next to the Stars and Stripes . . .

AS PROUD A FLAG AS INDUSTRY CAN FLY

Signifying 90 Percent or More Employee Participation in the Pay-Roll Savings Plan

IT doesn't go into the smoke of battle, but wherever you see this flag you know that it spells Victory for our boys on the fighting fronts. To everyone, it means that the firm which flies it has attained 90 percent or more employee participation in the Pay-Roll Savings Plan . . . that their employees are turning a part of their earnings into tanks and planes and guns *regularly,* every pay day, through the systematic purchase of U. S. War Bonds.

You don't need to be engaged in war production activity to fly this flag. Any patriotic firm can qualify and make a vital contribution to Victory by making the Pay-Roll Savings Plan available to its employees, and by securing 90 percent or more employee participation. Then notify your State Defense Savings Staff Administrator that you have reached the goal. He will tell you how you may obtain your flag.

If your firm has already installed the Pay-Roll Savings Plan, now is the time to increase your efforts: (1) To secure wider participation and reach the 90-percent goal; (2) to encourage employees to increase their allotments until 10 percent or more of your gross pay roll is subscribed for Bonds. "Token" allotments will not win this war any more than "token" resistance will keep our enemies from our shores, our homes. If your firm has yet to install the Plan, remember, TIME IS SHORT.

Write or wire for full facts and literature on installing your Pay-Roll Savings Plan now. Address Treasury Department, Section D, 709 12th St., NW., Washington, D. C.

Make Every Pay Day "Bond Day"

U. S. WAR Bonds ★ Stamps

This Space is a Contribution to Victory by ELECTRICAL WEST

ELECTRIC POWER MOBILIZED FOR WAR

(Reading Time: 1 Minute, 30 Seconds)

Expanding war requirements in the Pacific Northwest have created an unprecedented need for electric power. Although this abnormal demand is super-imposed on normal peace time requirements, the business managed electric light and power companies are meeting their share of the responsibility.

Such preparedness is not a hastily erected bulwark. For 50 years these companies have been pioneering in hydro development, in long distance transmission, and in interconnection.

In the transmission grid of these private power companies, which blankets a large portion of Washington, Oregon, Idaho, Montana and Utah, are 16,000 miles of high tension lines connecting 250 generating plants with a capacity of 1,800,000 kw.

Careful coordination of the operation of the plants on this network has added from 50 to 100,000-kw. firm capacity.

The great federal plants at Bonneville and Grand Coulee are rushing installation of generators to a total of 1,500,000 kw. Recent contracts between the federal government and some of the private companies call for additional interconnections between the company systems and the federal systems that will further strengthen this vast power reservoir.

Within the area are industries producing vital war machines, munitions and ships; important ports, docks, drydock facilities, naval bases, air bases, army cantonments, munition dumps; mines and reduction plants producing one-third of the nation's copper, one-half of its lead, one-fifth of its zinc and sizable quantities of aluminum, vanadium, cadmium and chrome. In addition, the forests of the region produce one-third of the nation's lumber and its agricultural areas make substantial contributions to the nation's food supply.

The business managed electric utility companies have been given a big job. ***They are doing it.***

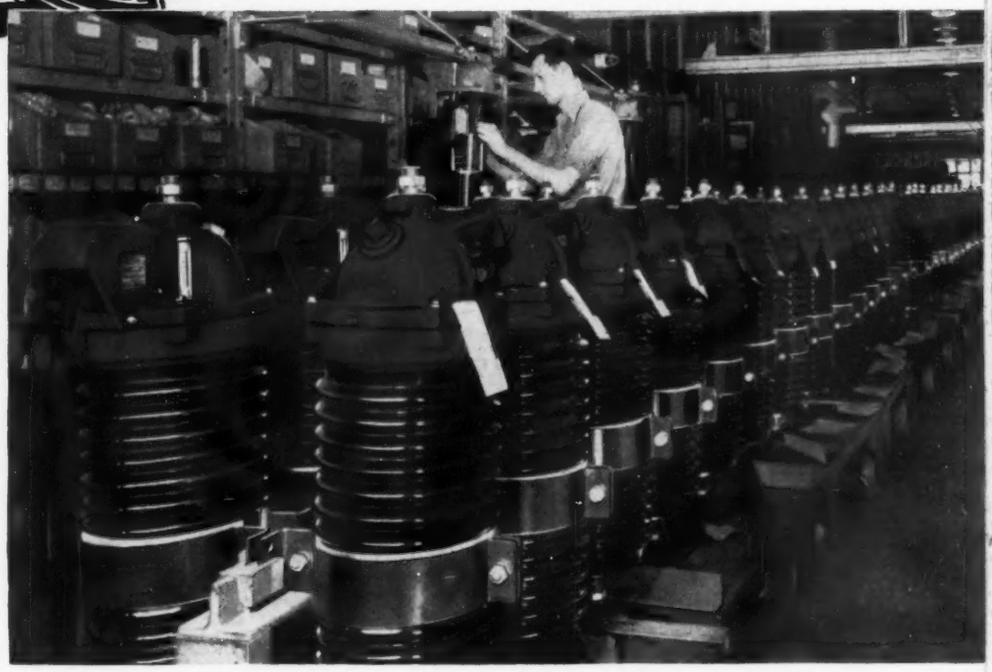
NORTHWEST ELECTRIC LIGHT and POWER ASSOCIATION

418 SPALDING BUILDING **PORTLAND, OREGON**

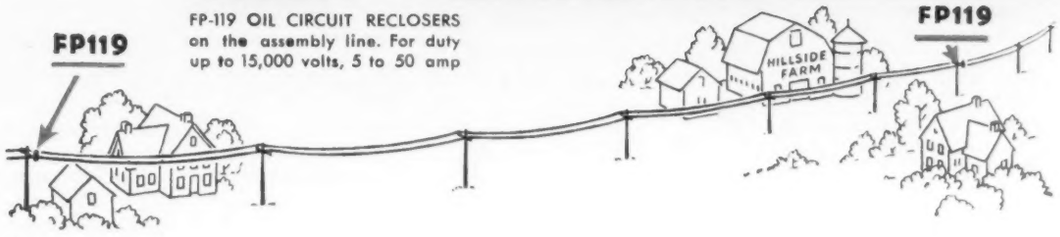
Hand your outage troubles to these

"RED CAPS"

G-E Oil Circuit Reclosers Enable Your Light-load Rural and Suburban Lines to Give Metropolitan Service



FP-119 OIL CIRCUIT RECLOSERS on the assembly line. For duty up to 15,000 volts, 5 to 50 amp



HERE'S WHY—

EVERY Fault Gets Three Chances to Clear—and up to 90% of them (temporary faults) clear within the three reclosures provided. What's more, RED CAPS reset automatically when the fault has cleared on the first, second, or third reclosure—the next fault gets three chances too. They lock open only when the fault persists even after the third reclosure.

They Ask No Replacements. G-E RED CAP reclosers clear the circuit by means of *breaker* action—low maintenance, *oil-blast* breaker action. No burned-out parts to replace, even after scores of service-saving operations.

RED CAPS Are Veterans—with the advantage of ten years experience in recloser design. They've improved service—at a profit—for hundreds of users from Canada to tropical Puerto Rico.

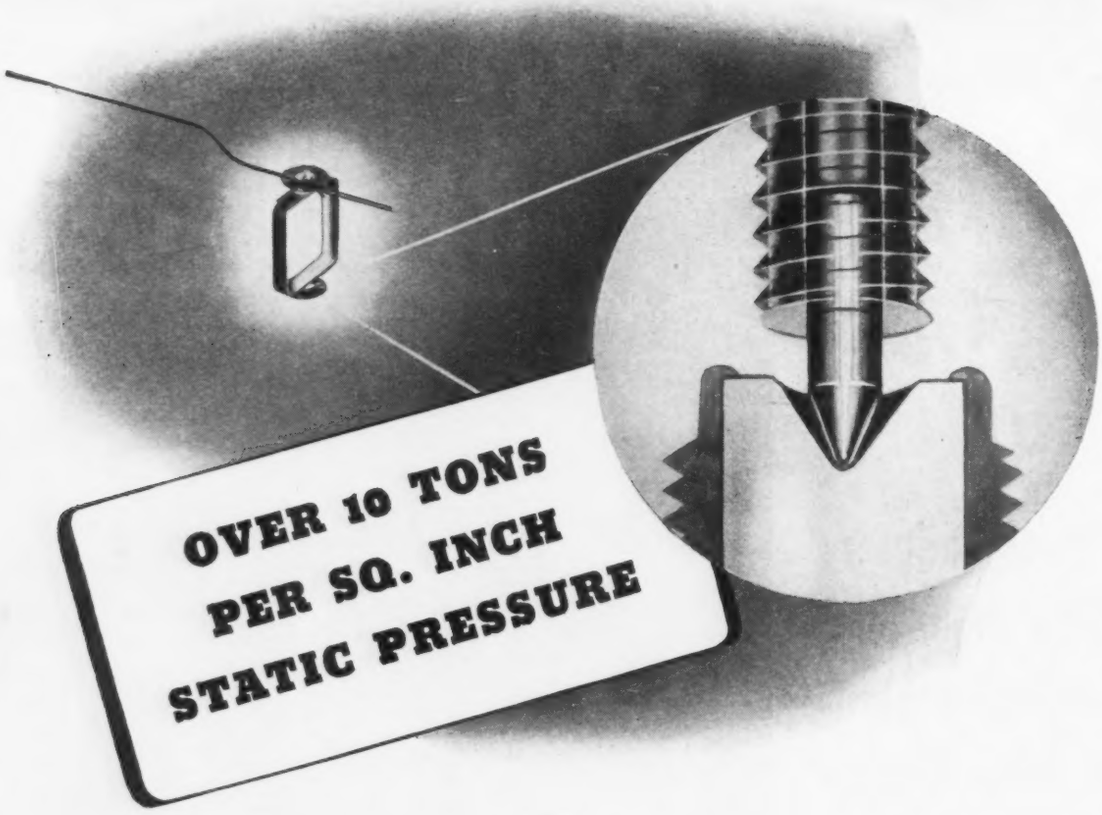
These reclosers now sell for only $99. Just figure it out—you may find that when installed on your more troublesome, more important feeders, they'll save you far more than this.

For additional information, ask for Bulletin GEA-2846. Write to the nearest G-E office. *General Electric Company, Schenectady, New York.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

857-5-7600



. . . on this tiny Instrument pivot!

Here the pivot for a WESTON instrument is being scrutinized for exact dimensions by the projection microscope, after meeting all other critical metallurgical standards. The bearings, also, exactly meet high WESTON standards because they, too, are processed and tested by methods which have been perfected through a half century of instrument specialization.

"How is it possible for WESTON so successfully to forestall friction in instrument bearings when the combination of design factors is so critical?"

First let's look at these factors. The bearing may measure only 3/32 in. dia. The tiny steel pivot, supporting a moving coil weighing only 1/100 ounce, may have a point several times sharper than the finest needle. The static pressure between them will exceed 20,000 lbs. per square inch; and the starting torque may only be the result of minute energy produced by a few microamperes. Yet that pivot must swing freely perhaps millions of times during the life of an instrument!

Here, again, the answer is to be found in basic WESTON design, and WESTON control of every step in instrument manufacture. Despite their extreme fineness pivot points for example, are formed to a *true sphere* . . . then the pivots are heat treated by an exclusive process to the exact hardness degree that resists crushing or mushrooming under the tremendous pressures involved. The "V" bearing, too, is carefully checked for precise dimensions and flawless surface by a special optical method which insures perfect operation of pivot and bearing.

But supplementing these and other WESTON methods is the skill of instrument craftsmen who have acquired the "know how" through years of instrument specialization . . . to whom the term "friction-free" is ever an ideal capable of achievement. For only through *specialization* can the superior techniques be developed, the "know how" be acquired, the ideal be so closely achieved . . . to insure that *instruments provide the accuracy and dependability so typically* WESTON . . . Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, N. J.

WESTON

Instruments

LABORATORY STANDARDS . . . PRECISION DC AND AC PORTABLES . . . DC, AC, AND THERMO SWITCHBOARD AND PANEL INSTRUMENTS . . . INSTRUMENT TRANSFORMERS . . . SENSITIVE RELAYS . . . SPECIALIZED TEST EQUIPMENT . . . LIGHT MEASUREMENT AND CONTROL DEVICES . . . EXPOSURE METERS . . . AIRCRAFT INSTRUMENTS . . . ELECTRIC TACHOMETERS . . . DIAL THERMOMETERS

WESTERN REPRESENTATIVES

Seattle, Wash.
Eicher & Bratt,
262 Colman Bldg.

San Francisco, Calif.
Herman E. Held,
420 Market St.

Los Angeles, Calif.
Edward S. Sievers,
417 So. Hill St.

Denver, Colo.
Howard Peterson,
1921 Blake St.

Phoenix, Ariz.
J. E. Redmond Co.,
448 W. Madison St.

DESIGNING A TRANSMISSION LINE?

You can speed up deliveries by giving this data when specifying . . .

CONDUCTOR SUSPENSION CLAMPS

The burden of selecting suspension hardware can be quickly and efficiently taken care of by placing the problem before B.T.C. This is especially true of the all-important item of clamps.

The following information is essential in selecting suitable Clamps:

Conductor Material — Copper, A.C.S.R. or other Composites.

Conductor Type—Standard concentric stranding or the increasingly popular "Hollow Copper" expanded diameter types such as General Type H.H.; Anaconda I-Beam Core; Phelps-Dodge Stranded-Tube Core; Copperweld Composite Type S or V, and similar cables.

Conductor Manufacturer and Design Number.

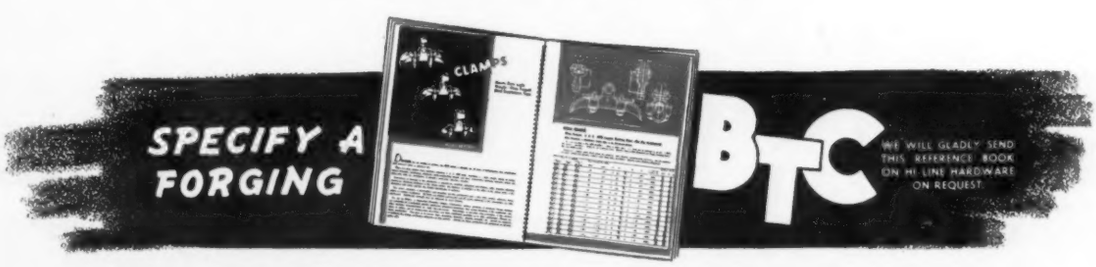
Conductor Diameter and Ultimate Strength.

Minimum and Maximum expected vertical line angles—standard designs for "Hollow Copper" conductors are generally designed to accommodate angles of 5° to 25° with adequate allowance for possible vibration.

Liners—The use of soft aluminum or copper liners in clamp bodies and keepers is recommended but not considered absolutely necessary for use on A.C.S.R. (If used without armor rods) and on the "Hollow Copper" conductors. The present shortage of aluminum and copper should be seriously considered and your conductor manufacturer consulted.

The above are the essentials—other pertinent data as to stringing tensions, design loading, slip strength, et cetera, are helpful.

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK



On through the night!

THE lighted windows that gleam all night in thousands of factories and power stations tell the story of power's importance in the keyed-up industrial activity of these times. The busy machines and the men behind those windows depend on unfailing power and light. The responsibility for electrical transmission and distribution can safely be entrusted only to wires and cables of the highest quality.

Electrical wires and cables produced by American Steel & Wire Company play a vital role in transmission and distribution. They serve well because they reflect the engineering skill and manufacturing experience that can be gained only by years of constant, progressive endeavor — because their quality is controlled through every step of manufacture.

Looking ahead to the time when demands for power and light will exceed even those of today, our engineers are working tirelessly on new ideas to improve still further the quality of our products.

COLUMBIA STEEL COMPANY, *San Francisco*
Pacific Coast Distributors of U·S·S Electrical Cords and Cables
Manufactured by
AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
United States Steel Export Company, New York

ELECTRICAL WIRES AND CABLES

American Steel & Wire Company Electrical Wires & Cables are serving from coast to coast in the vital job of transmitting and distributing power and light. They are manufactured under the closest control, from the first operation to the last, and embody all latest improvements in design and construction.

UNITED STATES

USS
STEEL

ELECTRA'S HUSBAND

Lights and Wires

"MOTHER, look — the lights!" The delighted cry burst from the lips of an eight-year-old freckle-faced youngster. And thereby hangs a story. It happened to Electra's sister-in-law, who drives for the Red Cross Motor Corps.

One of the by-products of the war turned over to this superb volunteer organization is that of meeting the boats that slip into West Coast ports with their loads of evacuees from points in the Pacific war zone. Night or day a telephone message is likely to come from headquarters, "Report at Pier X immediately." No forewarning. Just, "report." And hundreds of women volunteers drop what they are doing and drive their cars to the designated pier.

This particular day the call came late in the afternoon, although if one had been watching the waterfront, he might have seen the great grey or black-painted ships steam past and have known that more of the war's refugees were arriving. It was dark by the time Electra's sister-in-law drove her car onto the pier to pick up its load of passengers. Word had drifted down the line of cars long before that the evacuees were from Honolulu—families of Army and Navy personnel and civilian workers being transferred from the war zone.

Two of her four passengers were obviously mother and son. The sailor who loaded their baggage into the luggage compartment had said they were the wife and son of a naval officer. They were destined for one of the uptown hotels for the night. The following day they were taking a train for the Middle West. The interior of the pier was dimly lighted, except for the spots where passengers were being interviewed and were claiming their baggage. Already stevedores were unloading such cargo as the boat carried so that it could be reloaded with implements of war and a human cargo of khaki-clad men to be rushed out to far away shores where attack might be imminent.

Few words were spoken as the car turned and headed out through the pier doors. And then as the car pulled out on to the brightly lighted street flanking the pier, the boy spoke:

"Look, mother—the lights!"

The thrill and excitement in the voice caused Electra's sister-in-law to look. There was nothing unusual about the lights. There were three or four animated colored semi-spectacular signs atop nearby roofs. The street lights were bright, but not as bright as were those on the main avenue into which they shortly would turn. Cars and trucks were passing with their gleaming headlights. Storefronts were lighted. So were windows. But it all was normal. Maybe a little bit less than normal. And then she remembered. Honolulu had been blacked out every night since Dec. 7. For more than five months the lad had not seen an electric sign, a street light, a lighted shop window.

As they drove up the main street, then into the shopping district, the youngster continued to talk

"Mother, can't we get out and walk so's we can look in the windows?"

The car drove by a theater.

"Let's go to the movies tonight, mother. The sign says it's Gary Cooper."

As she left them at the hotel, the last thing she heard was:

"If we hurry, mother, we can go for a walk and look at the lights."

When Electra and I heard the story just as it is written here, she said:

"May the lad never see another blackout or experience the fear that goes with one. This gives light a new meaning to me and you ought to pass it along to the people in your industry. Look out the window at them—the lights of freedom, of liberty, of hope, of certainty for a better world."

JUST BY WAY of revealing the purpose of Nazi occupation of Norway, a Norwegian chap who escaped, showed Electra a pamphlet distributed among German troops. It included a handful of terms in the Norwegian language needed for everyday conversation. One of the first was, "Where are the keys to the safe?"

ELECTRA pays little or no attention when we talk about technical phases of the industry around home, but she had her say when one of our dinner guests told about the copper and bronze hanging in the unused trolley system of the San Francisco-Oakland Bay Bridge. It involved a little matter of the attitude of some labor unions, and that set her off like a Fourth of July burst of fireworks. You see she was one of the millions who registered their sentiment with Congress on the 40-hour week and time and a half and double time for overtime.

It seems that there are 53 miles of catenary strung on the bridge and in the adjacent yards which carries no electricity since the Key System took over all commuter transit on the bridge. Fifteen miles of this is very heavy main line copper catenary which weighs about 166,000 pounds. That's 83 tons, or enough copper for plenty of shells—quantity depending on the caliber. But that isn't all. There are 57 tons of bronze trolley fittings, etc.

"That's only 15 miles," Electra said. "What about the rest of the 53?"

"Well, the other 38 miles of catenary hanging over storage and other tracks," our guest continued, "represents another 120 tons of bronze. On top of that there is a lot of steel."

He went on to point out that someone had suggested that this store of critical materials could be put to good use in the war effort, since copper and brass top the list of vital metals. So the transit system prepared to take it down with its employees and specialized equipment. But right then some of the unions stepped into the picture. The bridge is state-owned so they went right to the governor.

"We put it up and we'll take it down, or there will be a pot full of pitch spilled from here to the polling places for the next election," was the gist of their message.

So the trolley wire still hangs. The transit company can't touch it because its employees don't belong to the right union. Its plan to remove the wire during slack traffic hours so as not to disrupt commuter service is out.

"Why doesn't someone tell General DeWitt or Admiral Greenslade," Electra interrupted. "Maybe you think that's getting to be a regular slogan of mine. Well, it is. Let the Army and the Navy tell these birds just who is fighting this war."

In this case the Army and Navy know about it. Perhaps by the time this is printed they will have done something about it and the copper and bronze will be on the way to a factory where it will be turned into death messages for the Axis gangsters. And maybe it still will be hanging.

NEW

.. to help you plan protective lighting

You need the new L-M Bulletin "Light Up To Protect War Production" to help you plan effective protective lighting. If you have not yet received your copy, send for it at once.

This helpful bulletin explains the principles of protective lighting, discusses mounting arrangements and typical layouts, describes in detail the complete L-M lighting services and tells how these services may be enlisted to assist you.

Also shown and described are the principal L-M Protective Lighting Luminaires and the accessory equipment necessary to a complete installation.

Be sure you have this bulletin if you are concerned with Protective Lighting — ask your L-M salesman or write the nearest Line Material Company Pacific Coast office for L-M Bulletin 4231.

FOR VICTORY BUY UNITED STATES DEFENSE BONDS STAMPS

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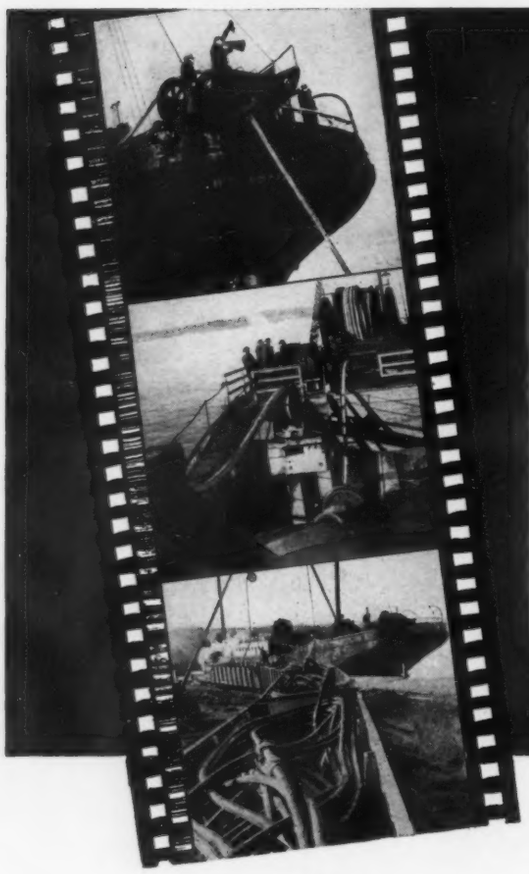

THE OKONITE COMPANY *Announces*

A New... Interesting and Informative Motion Picture "Laying Another Submarine Power Cable"

This new Okonite motion picture shows all the interesting operations involved in laying a single 22,000 ft. length of Submarine Cable across Puget Sound.

It is the longest length of Submarine Power Cable ever installed without joints and is designed for operation at 3 phase, 23,000 volt grounded neutral. Made in natural colors with narration by Ray Forrest, the film (available in 16 mm.size only) takes fifteen minutes showing time.

Okonite pictures are furnished free and express charges paid both ways at the request of any responsible organization or person. When writing, please give, if possible, three choices of dates.*

THE OKONITE COMPANY
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* At present this offer applies only within the continental United States.

OKONITE INSULATED WIRES AND CABLES

ELECTRICAL WEST

VOL. 88 NO. 6
JUNE, 1942

War Brings New Demands

S. P. MacFADDEN
President, NWEL&PA

PUBLIC utilities have always had many problems to face, and the electric utilities of the Northwest seem to have faced and solved more problems than have utilities of other sections in the United States. In the past year a considerable number of new problems have arisen. A year ago we were all busy with national defense, but now we are busy winning the war.

An examination of matters, which are directly related to the war effort and require the time and attention of utility executives, shows that one of the major problems is providing facilities and improvement in facilities to meet the demands of the war emergency throughout this Northwest area. A very large portion of the construction budgets of the different companies for 1942 represents capital expenditures which have been made necessary by the war.

Utility executives also are confronted with problems of supplying continuous service under the most adverse conditions which may develop. This involves interconnection of the utility systems with numerous private and industrial plants throughout the territory to make the maximum use of existing generating capacity, to utilize waste fuel and conserve oil, and to maintain adequate emergency reserves which are available to all of the systems. This also involves the installation of various electrical equipment at important interconnection points in order to make the supply of electrical current available at the load centers. It calls for many changes in transmission and substation facilities to provide interconnection between both the privately owned and publicly owned systems. The demands for increased power requirements throughout the Northwest, particularly from Army and Navy posts and from industries, many of which are located at points not adjacent to existing service, come up unexpectedly and service is required immediately. These problems involve careful engineering and planning, the obtaining of materials and the actual installation of equipment.

In those utilities where some of the power is generated by steam, the fuel oil situation has been critical ever since war was declared. Executives have had to be in constant contact with the fuel oil companies, oil committees and oil coordinators in an attempt to keep a supply of oil available for steam plants, which in these times are essential in supplying electric power to war industries. These steam plants also have economic value to the interconnected systems of both the private and public power systems since they furnish relay to the hydro plants.

The Northwest utilities foresaw the possibility of utilizing industrial plant capacity and waste fuel long before war was declared and these companies were among the leaders—if not the leaders—in planning to make use of such capacity.

The Federal Power Commission has been actively engaged in surveys and studies directed toward maximum use of the electrical facilities in the Northwest for the war effort and utility executives have been and are still in constant conference with representatives of the commission, assisting them with this work.

Another time-consuming problem has been that of plant protection. Again in this matter Northwest utilities have been in the forefront. Anticipating the need, some of our member companies had plant protection programs under way long before it became a nationwide program under the direction of the Federal Power Commission. Then in 1940, under the direction of the FPC and acting upon presidential instruction, the companies proceeded to provide what was felt to be adequate protection against sabotage in all of the major power plants and at other strategic points throughout the interconnected systems. This program has increased since the declaration of war and, while it has been carried on under the direction of the Federal Power Commission, it has been necessary to keep in constant contact with Army and Naval authorities in connection with it. In addition to providing lighting defense, bomb protection, etc., many of the companies employ as many as 100 armed guards.

Another major problem which must be faced is the matter of priorities. This involves almost constant contact with the representatives of the War Production Board, making applications and following them through to obtain the materials necessary to take care of the demands of the war industries and Army and Navy establishments.

Another executive problem is personnel. The loss of men to armed forces, to war industries, government bureaus and others has been on the increase, and the matter of obtaining replacement employees and training them presents difficulties. Registration under the Selective Service Act of men from 20 to 44 years of age involves as high as 60 to 70% of the total male employees of the various companies. The turnover in employees has been great. Whereas for a long period of years the average turnover in utilities ran about 10 to 15%, the turnover increased to about 25% in 1941 and in some of the companies is running at the present time at the rate of about 50%.

This turnover in employees probably will increase. While 60 to 70% of the male employees are registered under the draft, probably 30 to 40% of the present male employees of the utility companies will be taken by the armed forces and others will be lost to war industries and government bureaus.

Turning to the engineers, we find that they too have many problems brought on by the war. The electrical generating, transmission, and distribution systems have been called on to carry tremendously increased loads. Demands for electric power are coming like an avalanche from all types of war activity. In some areas the United States Navy is constructing various enterprises which require power, such as ammunition depots, radio stations, torpedo stations, naval training depots, naval air bases and storage supply depots. The Army is constructing air bases, cantonments, quartermaster depots and similar facilities, all of which require power. Extensive housing authority construction means that literally thousands of homes are being built, particularly in

the vicinity of military posts and war industries. All of these homes have to be supplied with electric power. The tendency is to use complete service in many cases—electric cooking and water heating as well as lighting. These require extensions, not only of the local distribution systems but of the substations and trunk transmission lines clear back to the source.

The problem of priorities falls directly on the engineers. The War Production Board exercises a rigorous control over our use of materials, and the engineers cannot turn a hand to any construction job, draw out materials from stock or purchase materials without first getting a priority allocation from the WPB. The application for such a priority allocation is quite an involved document with numerous questions, and frequently requests come back by telegraph for more and more data and a considerable amount of time is consumed in the preparation and followup of these applications.

In the past engineering departments have drawn up standard plans and specifications for most of their work, having in mind a reduction in the amount of engineering time and construction labor and also improvement in the efficiency of the work to be done. Under present conditions engineers find that their standard plans and specifications cannot be followed. They have to use a different type of material; they have to follow a different plan of construction. Where formerly they could string copper conductors, they must now, in some instances, use iron wire. They have to substitute wood for metal. It is now necessary to more or less hand design practically every job which, of course, requires a great deal of time.

Interconnections with industrial plants mean conservation of fuel and the supplying of additional power reserves, whether or not the cost of power is higher to the utilities. These interconnections involve quite a bit of engineering work. A project engineer has to go out and investigate each individual plant and all of its operating conditions to determine what power is available and at what hours, what type of fuel is being used and the cost of establishing a connection. All of that takes time.

Personnel Shortage Felt

On top of all of these problems the engineers have the additional difficulty of scarcity of men. There is a definite shortage of engineers in the country and this shortage is particularly felt in the Northwest. Utilities have had to comb the country and most companies could double their engineer staffs and still not have surplus personnel. It has been necessary to work engineers overtime to the point where additional hours would mean loss in efficiency. Engineers are accustomed to dealing with difficult situations, however, and the engineers in the Northwest electric utilities are solving these war problems as they arise.

MacFADDEN

Sales departments also have their troubles. No longer are they selling ranges, water heaters, refrigerators and other appliances, nor are they purposely building load. The primary purpose of the sales or utilization departments in these days is giving assistance to military and war industry customers in solving their problems, and assistance to other customers in the conservation of their present equipment. This may mean the incidental addition of load or it may mean a decrease in load. The primary thing is to help win the war.

Customer Aid Given

Assistance is being given to customers in the form of new applications of electricity which will enable greater production at lower cost in the factory and on the farm. Customers are being given practical information for the economical use of their appliances and the service itself. Customers are being presented with the latest information on nutrition as sent out from time to time by government agencies. Electrical dealers are assisted in the substitution of merchandise not affected by priorities for those items restricted on account of war needs.

The programs of all sales or utilization departments in the Northwest this year are dedicated to winning the war, because we recognize that the emergency demands the full cooperation of every element of American life if we are to survive the present threat to Democracy. The utilization departments are endeavoring to do their part by assisting and advising customers relative to more efficient and practical uses of electric service, so that the essentials of defense may be produced more efficiently and the health of the people protected.

Detail Work Heavy

Accounting departments during the past year have been confronted with the ever-increasing demand of federal bodies for factual data concerning inventories of supplies and uses of those supplies during the past few years. Priority rulings and "freeze" orders have demanded much greater detail and consequently more supervision with respect to the care and custody of supplies. New controls, additional checks and greater care in handling have all been necessary to effectively cope with this emergency. Most companies have had to establish a separate section within the accounting department to take care of this emergency work. The stage has almost been reached of having each item of material fingerprinted.

Most companies in the Northwest are at the same time increasing the number of customers on their systems. This has necessitated more accounting personnel. On the other hand, additional accounting machines in most instances cannot be had and the companies have had to do additional work with the equipment currently on hand.

The problems are many and affect all phases of the electric utility business. However, if they can be solved they will be solved by the Northwest utilities. This Northwest country is an area in which some of the greatest utility pioneering has been done.

The Northwest Electric Light and Power Assn. has been a stabilizing and unifying organization for the Northwest utilities. It was organized in 1908, prior to the old NELA and has carried on for 34 years. It was a pioneer as an electric association. The Northwest companies pioneered in long distance transmission of electricity and the interconnection of electrical systems in order to increase customer benefits. Northwest utilities were the first to build rural electric lines in America. It was in the Northwest that the first experiments were carried on for electric cooking. It was out here that electric water heating was developed. The Northwest leads the nation in low rates. This has been the result of interconnections, efficient operation and sales effort in increasing average domestic and farm consumption.

With such a background of meeting and conquering past problems, we can feel quite confident that, despite the many complex situations introduced by the war, the Northwest utilities will obtain the answers, thereby helping to win the war.

"Let's Get it Done"

By GEORGE TENNEY
President, PCEA

ANYONE even remotely affected by the war effort—and who today isn't—must realize the immensity and the pressing character of the job facing America. We as a united people have a war to win. It's a bigger job than anything the nation ever tackled in its 168-year history. "Let's get it done." Let's get it done just as quickly as is humanly possible. Let's get it done with the maximum economy of manpower and money and the maximum efficiency in use of equipment. But if sacrifice and suffering, if dislocations and conversion, if "blood and sweat and tears" are required, from each of us individually or from us all collectively, let us willingly give to the utmost, that the job may be done, speedily, efficiently and completely.

Without question everyone in the electrical industry is definitely committed to this idea. As an industry we have dedicated our efforts to a victory that must be final and complete. Manufacturers and contractors, utility men and wholesalers, engineers, distributors, dealers, inspectors, wiremen—all are in agreement that only by unity of purpose and unity of effort can we collectively as an industry or individually as Americans turn our resources and our ingenuity to the ultimate task of winning the war.

All of this is because never before has a war so directly and forcibly affected the affairs of public and business alike. Modern war is an industrial struggle. Eighteen men must work ceaselessly behind machines to keep one modern fighting man at the front. A little simple arithmetic using this figure for a multiplier can give a quick appreciation of the physical size of the task confronting the nation. Manpower Board Director Paul McNutt has said that a 3½ million man Army will be in the field by the end of 1942. At the 18 to 1 ratio this means that 63 million men and women must fight the thousands and thousands of battles for production in the nation's factories. But the national labor force is only 54 million, and of this number more than 10 million are working in agriculture. So there is a deficit of 19 million industrial workers. How will it be met? By the same method of conversion that has been applied to industrial plant facilities. It means a draft on the white collar workers, on the merchant and his sales force, on the service trades and businesses as well as on women and school age groups.

Yes, America is fighting an industrial war. We know that industry and electric power are synonymous. Because electric power and electric machines have played such an important role in the productive scheme of peacetime America, the new responsibilities and obligations of the industry in the war assume strategic importance. For one thing electric power and machines must help fill the gap caused by a shortage of workers. Just one example can be cited to show the degree to which this can be accomplished. Electric welding is turning out vitally needed ships in half as much time and with half as much manpower in this war as in 1918. James F. Lincoln has said within the last month that it would be a very simple thing to double the production with the same number of man hours in this field solely by increasing the size of the welding electrodes used by a small fraction of an inch. Electricity can and will repeat this accomplishment in other fields of war production.

Assumption of wartime obligations and responsibilities has meant forbearance and sacrifice by all branches of the industry. Dislocations associated with changing from a peacetime to a wartime economy have brought multiple new and difficult problems. These have included shortages of critical materials, priorities, conversions from normal to war production, increasing federal control, regulation, and restrictions, personnel difficulties, the threat of inflation, higher and higher taxes, liquidation, rationing and finally, the threat of inflation. The accompanying burdens have taxed management and men. And if we are realistic, the load will become heavier and the problems more difficult until we get the job done.

TENNEY

Some of the changed conditions warrant further examination and exploration. Mention has been made of the governmental control, regulation and restrictions occasioned by war. As an industry and as individuals we should ever bear in mind that the need for vigilance against encroachment of freedom and liberties is greatest in emergencies. A taste of the power that goes with public office frequently serves only to awaken an insatiable appetite for more power. Once any man becomes cloaked with public authority, the ever-present temptation is to don the regal robes of absolute dictation. To finish the job of winning the war, only to find that we have lost liberties and freedom at home, would be a dear price to pay.

Along with the liquidation of some of the small businesses in our industry occasioned by wartime conversion, might we not hope for a liquidation of some of the prejudices and special privileges that have caused strife and internal dissension? A lot of the economics applied to the light and power industry in recent times by men in high offices have been mixed with and adulterated by politics. At least we might expect a truce for the duration.

The pinch of rationing already is making itself felt. Yet more rationing may come. Before the full demands of war industries are met, it may be necessary to ration electric power to homes and commercial customers. If such need arises, let us be sure that the emphasis is placed in the right place. We should tell the public that curtailment is not required to save electricity—*it is required to beat Hitler, Hirohito and Mussolini.* The public will not cut down driving to save rubber, because Americans abhor compulsion. *But they will stop driving entirely if it will get the job done.* This is the real and valid reason for fighting and sacrificing and doing without.

So let's resolve to get it done. For what? For the assurance of political, economic and social freedom. For guaranteed spiritual privileges. For better and more creature comforts. For the preservation of enterprise and initiative and industry. For the things that are American.

Post War Program Vital

By J. W. ALEXANDER
President, RMEL

WHILE the war must now engage our best efforts, we can not blind ourselves to the future with its sanguinary economic conflict, which is inevitable. There must be no after-war Pearl Harbor stemming from our lack of preparedness.

We must begin at this hour to rally our forces and form our battle front to recapture our share of the buying market, for which there will be a wild scramble. The almost limitless supply of surplus, bargain-counter power that will flood the market must be absorbed through the efforts of the industry, else it will be an alluring invitation for hundreds of communities to venture into the electric business on their own account—to the exclusion of our own existing facilities.

Street and highway lighting will provide a substantial market for the surplus power. The league has, for several years, promoted better street lighting and, more recently, highway lighting, with the result that the Rocky Mountain Electrical League territory now operates one-third of all the mercury vapor and sodium vapor street and highway lighting of the nation.

New Problems Ahead

One of the immediate aims of the Rocky Mountain Electrical League is to perfect a postwar business-capturing council that will give constant attention to plans for conserving our business and our very existence. Preliminary plans for this undertaking were discussed at a special conference in Denver, May 19.

Admitting that the immediate aim of everyone is victory—quick and complete—we should not forget that postwar planning is essential if we are to resume peacetime activities with the least shock. We can't overlook that hard nut. There will be power in abundance to sell. We must be ready to resume appliance sales promotion, not only of the old standbys which have built our business, but of the many new products that will be available. Our whole distribution mechanism must be geared up to meet the new conditions and the new competition we will ultimately face. There will also be the personnel problems in making adjustments for the men who will return from war. The new council will have plenty to think about.

However, if we can be ready with plans, we can look forward with some degree of confidence. If past experience is borne out, then out of the war production effort will come new goods and services better in quality and greater in quantity that can be sold to the American public at lower prices. The list of such possibilities is too long to recite here, but even cursory consideration of the idea excites the imagination.

The league, since the first of the year, has taken an active part in several war and civilian defense projects and participation henceforth will be upon an even broader scale. As an example of the league's participation and emergency activities, its lighting section is now engaged in perfecting a blackout procedure and has been delegated as a technical advisory board to Civilian Defense councils.

Meanwhile the league is collaborating with government and local officials in the conduct of the current effort to gather junk metal for conversion into war necessities. Likewise it is conducting a very successful surplus material campaign—arranging for sale, exchange or purchase of useful surplus materials among member companies.

Notwithstanding the number of activities which have, of a necessity, been frozen, other responsibilities and activities are demanding full time and extending the efforts of its various committees, sections and divisions. The accounting and engineering sections, in particular, are being taxed with demands for advice, counsel and services of many kinds. The league is demonstrating that it is an established institution, fitting directly into the emergency, as well as a peacetime business promotion and technical body.

ALEXANDER

Super Market to Come

For the postwar period the electrical industry envisions a super-market for its products and services in the homes of its customers.

To meet these new demands the industry's plans for the postwar period must be developed in terms of providing a "super-service" for its customers.

The industry is in a splendid position to lay its plans for the postwar period because of the well advanced stage reached in the operation of the Adequate Wiring program. Now in its fifth year, this electrical industry project, to promote the building of adequate electrical highways to serve its customers moving into new homes, has developed an organization and attained a momentum that will follow through on the job of building the electrical superhighway for super-service to a supermarket in the postwar period to come.

The engineering and accounting sections of the league are rendering more direct service than ever before. The most important unit of the accounting section is the priorities committee. This body meets weekly to pass upon rules and regulations coming out of Washington. The purpose of the weekly meetings is to interpret such rules and regulations, so that electrical contractors, utilities and other members may be properly guided.

An advertising copy-writing service was placed at the disposal of league members following the managers' meeting in Denver. Practically every company in the jurisdiction of the league has agreed to use this service. Institutional, rather than commercial advertising, and publicity will be the objective of this program.

The league, from day to day, is amply demonstrating its value as a wartime agency, as well as a peacetime adjunct of the industry. Practically every unit of the industry represented in the league is taking a part in its manifold activities.

During the present year league headquarters has seen more conferences and meetings than ever before. Electrical contractors, dealers, utility representatives and others have availed themselves of the league's assembly room almost daily.

B. C. Electric Ready

If air raids come, 700 trained volunteers will man the company's emergency squadron.

They shall not pass—without a pass and here are Bill Ross and George Durham to make the order stick. A large force maintains 24-hour patrol

WILL Pacific Coast communities be bombed? Who knows? "Expect the worst and be prepared beforehand" is the slogan of the public utilities, particularly as exemplified by the British Columbia Electric Railway Co. This company has set up a permanent Air Raid Precautions organization staffed by 700 voluntary workers drawn from the regular employees. It is ready to function quickly and expertly in any emergency.

Maintenance of electric power, gas and transit facilities as far as possible under the most trying conditions is the aim of this ARP organization. If the experience and misfortunes of communities in the war zone which have been subjected to aerial attack are followed, then under similar circumstances, power lines in Vancouver would go down with live wires sputtering on the ground. Poles would be broken. Gas mains might be struck and ignited. Streets would be torn up, tracks twisted, cars and buses derailed and overturned.

To meet any such emergency a control center has been set up and staffed 24 hours a day. A permanent control room serves as an action station to relay warning messages and orders received from provincial headquarters to various parts of the company system. When an imminent danger signal is sounded, the company's transportation manager, gas engineer and chief engineer take over the action center, assisted by one or more station operators. Supervision of maintenance of all company service is then directed from this control center. Supplementing the regular B. C. Telephone service are the company's private lines linking all parts of the system. Radio also is installed. Maps of lines and stations cover the walls.

Six mobile repair squads have been organized and equipped for the purpose of removing any hazards caused by an air attack. Each consists of five linemen, five gas men and five truck men with full equipment. Each member of the squad is a volunteer and is on call 24 hours a day. The foreman in charge is so intimately acquainted with the system that he can immediately locate the nearest gas valve or power switch without reference to maps. These crews are backed up by regular maintenance squads that would be dispatched to points where vital repairs were to be made. Speedy restoration of service is the watchword.

Above, John Sperring and Fred Easley guard vital power lines against fire. Below, Len Osborne shows the correct way to handle an incendiary bomb

Supplementing the control room and mobile crews is an ARP organization that blankets the system. Fire watchers and fire fighters have been trained for every building. Fire fighting equipment has been placed at strategic points in all buildings. Closest cooperation is maintained between the company organization and the regular civilian ARP body, as well as with the Royal Canadian Mounted Police and city and provincial police.

When Will War End?

THE WAR will end "when the Germans, and the Japs and the Italians are defeated." This opinion is based on the fact that "no conflict is ended until one or both adversaries fall, either defeated or exhausted." From answers as succinct and forthright as this, through others which the authors admitted represented either "wishful thinking" or "pure guess," some 74 men representing a cross section of the electrical industry replied to the editor's two questions: On what approximate date do you believe the present world-wide war will end? On what do you base that opinion?

Some said such a poll was futile or presumptuous in view of the limited knowledge available to the lay public. But the majority hazarded an opinion, either from the American zeal for prognosticating almost anything or as representative of the program to which they were shaping their individual plans. The accompanying tabulation sets forth the dates—the median of which is the Spring of 1944. In numbers alone, there were more who thought the war might end in 1943 than in any other year.

Reasons for the dates set forth were as varied as the dates themselves. But there was one universal assurance—the productive industrial might of America would swing the balance. THAT WAS THE THING WHICH WOULD ASSURE VICTORY. The mounting wave of tools of war rolling from the industrial plants of this country was the key to victory. That and the will to fight to win for all time to come the things that have made and will preserve America.

The reasoning for choosing the date selected by the various individuals is set forth in extracts from their statements, arranged chronologically:

Before the End of 1942:

"As to Japan, inability to protect its perilously extended lines of communication in the face of an accelerating loss of transports and supply ships and the growing might of the allied air arm. . . . The allied powers will keep Russia in the war. Atlantic convoys are becoming more and more effective, new air bases already make it possible to give convoys air protection all the way to Ireland. This will release naval facilities for strengthening convoy protection on the route to Murmansk. England already has extended control of the air from the British Isles to points well over Germany. British air power is already being reinforced by American flyers and American ships."

"The German war production machine is cracking up. During the past year they have been able to conscript labor and utilize production facilities in the countries they have taken over. This, of course, has bolstered the German effort, but as time goes on the policing of the conscripted labor becomes more difficult to the point where their entire economy is destroyed and I believe this disintegration is taking place now. And paramount, I base the above opinion on the fact that the greatest industrial conversion from peacetime to wartime production that the world has ever seen has taken place in Detroit, Pittsburgh, California, and other industrial sections throughout our country. They are just beginning to roll and I, personally, feel that there is nothing that can stop the tide until such time as the Axis powers beg for peace and that time will be in the not far distant future."

Spring of 1943:

". . . Hitler's much touted summer offensive will fail this year; that the inhabitants of the subjugated countries will prove increasingly hard to handle; that the coming spring will find a tremendous offensive threat in Russia and that in the meantime we will have built up complete mastery of the air. You will note that I am ignoring the Japanese situation because you have no doubt read, as I have, the statement of some well-informed military man who said, 'The higher a monkey climbs a tree the more of his behind you see.' "

"All this prophecy is based on the wildest fantasy or hope that old Joe will keep that stiff upper Communistic lip which never quivers when Red Shirts meet Brown, whether the tundra be frozen, marshy, sun-baked or windblown. And I'm betting that Joe can do it this summer and next winter. Schickelgruber will then be all out of peanuts."

". . . the probability that the Russians will be able to maintain the initiative, or at least hold off the projected German attack until the Winter of 1942; that the Japanese will not be able to coordinate and derive sufficient benefits from their conquests during 1942; that the English air offensive on Germany's western front, together with the help of the United States will ultimately lead to the opening up of another front for the German armies; that the increasing strength of the United States should be a very potent factor by the Fall of 1942."

"Germany is definitely weakening in materials and morale, whereas Britain and America are daily growing stronger. When Germany cracks, Japan will know the jig is up."

". . . Russia will hold its present position during this Summer and that Germany will not be able to withstand another Winter campaign in Russia even though she might make some progress during the Summer. As a result, internal dissension and lack of support from conquered nations will force Germany to sue for peace early in 1943. Japan will sue for peace within ninety days thereafter."

"The Germans cannot pull an indefinite number of rabbits out of a hat, and the collapse of the Germans seals the fate of the Japs."

Fall of 1943:

"In the early part of 1943, the United States will have its production resources geared up to a capacity that will enable us to supply the United Nations with enough materials and ships so that an offensive will be started on fronts backed by mechanized equipment in sufficient quantity to overwhelm any Axis resistance."

"Obviously Germany will make a final desperate bid for victory this year. This will apparently commence with a drive through Crimea for the Near East oil, and will probably be accompanied by an operation of some kind in the Mediterranean as well as along the Russian front generally. Unless very definite and marked successes are obtained, Hitler and his party heads will be ousted by German military leaders. This will be followed by a determined drive for peace, resulting in cessation of hostilities by Germany and Italy in late 1942 or early 1943."

"Before that time the enemy nations will be overwhelmed by the size of our production and military victories that we will be able to achieve by reason of this production and the populations will not support a hopeless contest."

"Germany will be practically crushed this year and the submarine menace will be conquered to the point where the United Nations can concentrate their sea power in the Pacific. Japan can not, in my opinion, muster the necessary manpower, naval, and air power to protect the present greatly extended lines of communication so that when the Al-

lied Nations can concentrate their maximum power in the Pacific, I believe Japan will be quickly conquered."

"We will have sufficient air strength prior to that time to force a favorable decision."

Latter Part of 1943:

"While it must be admitted that the successes of both Germany and Japan have been spectacular, a majority of their gains have been in countries where the populations have not been 100% in back of the armies which were defending them. Whenever they have been opposed by people defending their own homelands, such as Russia and China, the type of resistance is very much more determined, and such advances as the enemy has been able to make in those countries have been at tremendous costs to them. In the offensives which they may attempt to start during this year, they should meet more of that kind of opposition than they have in the past."

> "As I see it then, there is strong evidence upon which to base the assumption that British and American air forces can impair German production sufficiently to put them out of the war by the end of this year. If that happens, it would permit a mobilization of Allied naval forces, together with ample air strength, to drive the Japs back along the routes they have come and probably do it much faster and in shorter time than they took to get there."

". . . The problem of transporting sufficient supplies to keep any sizeable expeditionary forces in action on any single front is astronomical and becomes a mathematical impossibility when we consider the war is flaming in all corners of the globe. On the other hand, the airplane has become not only the key factor in combat but in my opinion is apt to become the critical element of supply, particularly for China, the East Indian theatre and the Near East."

"The axis powers will 'shoot the works' this summer, but the action will continue on too widespread a scale to be decisive. United States production will be in full swing by the end of 1942, and from then on it will be a matter of 'mop up' until Adolf and his puppets cry 'uncle'."

"World War No. 1 was a war of Manpower supplemented with Machines; World War No. 2 is the reverse—a war of Machines supplemented with Manpower. It is going to take time for the Allied Nations to produce the machines, airplanes and ships, during which period the necessary manpower will be trained. The Allied Nations' all-out offensive will not start, in a real way, until their instruments of war and manpower are superior—and may be so maintained. Peace will not come when the Axis realize they will be defeated and desire to make the best possible deal. Instead, it will come when the Allied Nations have fully defeated the enemy and are in a position to dictate their own peace terms, and maintain them."

> "The real object of this war, in a millennial sense, is eternal liberty or, prosaically, the basic liberation of mankind from fear and want; a greater liberation of even our own democratic principles. Christianity and man's relation to God point the way."

"The frustration and inadequacy of certain peoples to achieve their purpose and ultimate destiny have culminated in Hitler and the Japanese war lords. If our civilization is to endure and the onward march of freedom and liberation of mankind is to reach greater fulfillment, then these enemies must be defeated."

"By the end of this year (1942) the industrial resources of this country will have been very completely mobilized for war production and ships will be sliding off the ways at a rate which will be sufficient to supply the transportation needed to deliver the products of our factories to the war zones. The manpower of this and the other United Nations will be fully mobilized and combat troops available so that the offensive campaigns may be started at various points. Sufficient planes will be available so that air superiority may be acquired and maintained in combat zones."

> "A growing realization of this fact, together with a fuller consciousness of the essential truth and understanding of our ultimate destiny on the part of all peoples, will, through moral force and the law of compensation, become our chief ally and hasten victory."

"The growing power of the Allies, particularly in the air. Supremacy in the air, when attained by the Allies, will be the beginning of the end for Schickelgruber, *et al.* Coincident with growing air power will come supremacy on the ocean, and the driving of the Axis from the water. Weakening of the Axis in manpower, material and morale, added to discontent and sabotage in the conquered areas, will make the marches to Berlin and Tokyo relatively easy."

Spring of 1944:

"If the Japanese could be put out of the picture, the European situation would be settled rather quickly thereafter. Having made the boat trip to the part of the world where the fighting with the Japanese is being carried on, I realize how God-awful far it is from here and what a tremendous task it is to move men and supplies to bases in that area. I do not believe the Japanese will be whipped by the bombing of their civilian population or by our actually landing forces in their country, but that they can be whipped by obtaining full control of both the sea and the air and cutting off their sources of supply."

> "It will take at least one more year before the full weight of our production becomes effective, and from six months to a year after that to use it on our enemies. It will take some major type of offensive program on our part in order to bring this conflict to an end."

"The Axis powers now have control of those areas and resources necessary to prolong their activities for several years. Their position is more or less consolidated. We, on the other hand, must attack this consolidated position from distant points requiring long supply lines, unlimited manpower. Even though our peak of production will possibly occur in the latter part of 1942, or early in 1943, the full force will not be felt until the middle of 1943, at which time there is a likelihood that the Axis powers may crack up through a

FALLACY PUTS WAR'S END IN 1942

	Hitler	Mussolini	Stalin	Churchill	Roosevelt
Born during	1889	1883	1879	1873	1882
Came to power	1933	1922	1924	1940	1933
Years in power	9	20	18	2	9
Age this year	53	59	63	69	60
	3884	3884	3884	3884	3884

It takes two factors to make a war, so divide the total by 2, and this is what you get: 1942

2) 3884. Consequently 1942 is when the war will end.

combination of internal and external pressure. I think it will crack up before they are definitely beaten in the field."

Summer, 1944:

"Hitler will be hard-pressed by the United Nations because of war materials which the United States can supply Russia and England—but Japan will be another problem; and in order to wipe Japan out of the picture, all the resources of the United Nations will be required to win the war with Japan."

> "We will not this year be able to prevent the Japanese from consolidating most of the territory grabbed since last December, including the Philippines, the Dutch East Indies and the Malayan Peninsula. . . . It will therefore take the United Nations at least a year to dislodge the Japanese when we finally get going in 1943."

"Civil populations generally are able to take a longer and more severe punishment than is the military. As soon as the German and Italian leaders are convinced that their cause is hopeless, they will allow their commands to disintegrate rapidly. I do not believe the German armies can stand over one more Winter on their Eastern Front, and I believe Russian resistance is increasing. The Japanese will take considerable more punishment before acknowledging defeat. They have established face, and can afford, therefore, to take some severe punishment before capitulation. It is my opinion that the islands of the Japanese Empire proper should be attacked, thus cutting off the sources of supply to the various expeditionary forces."

"*Germany is far from depleted in food, manpower or munitions and will not be licked by Russia this year or until the United Nations can control Africa and open another front against Germany through Italy, France or Scandinavia.*"

"I do not think Germany can win the war 'her way' this year, and I do not think that German morale can withstand another winter campaign. The material assistance the Allies are rendering Russia now will be felt very keenly, together with the fact that next Spring at the latest a second front is assured, which will cause the German leaders to attempt negotiations for as favorable a peace as possible at the expense of their alleged Allies. I believe it will take another year after that by which time our then powerful Navy can begin to fight its way in slow successive stages across the Pacific within close striking range of Japan."

" . . . based on two things: first, the increasing strength of our own and our allies' war machines, which will reach a peak in early '44; second, the Axis will be worn down to where its resistance will be noticeably less."

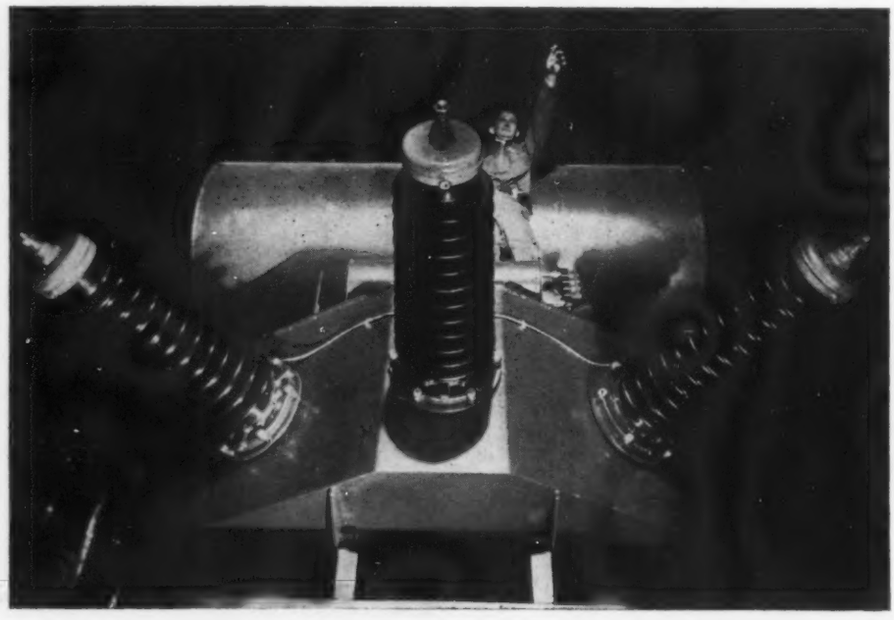
"Lack of bottoms will prevent effective movement of necessary war equipment to the widespread parts of our war activities until late '43. To insure the equality of man that exists in our own democracy and in the past democracies whom it is hoped may be restored by a righteous peace, virtual annihilation of the Axis leaders and their cohorts is an imperative need; and if it is achieved by September, 1944, you, I and our fellow man should be forever and ever grateful."

Winter, 1944:

"This opinion is based on the fact that the final defeat of the Axis powers will require the full production of the United States together with adequate shipping facilities to place that production in the hands of military power at the battle front. While our production may reach a peak the last part of 1942, in my opinion the main bottleneck is shipping facilities and it will be the last of 1943 before sufficient quantities of men and materials arrive on the battlegrounds of Europe and the Far East to cause an outright surrender of the Axis powers. It is my belief that the Axis will not surrender unless they are given considerable advantages which they have already won, and that the United Nations cannot discontinue the war until the Axis nations are finally subdued."

"To answer your letter of May the sixth
"There are two good dates I am torn betwixt,
"As a gesture of irony—with thumb to nose—
"November eleventh should be chose;
"But being a crapshooter of considerable acumen
"To bet a little would be only human,
"So while seven-eleven would be a gift of the gods
"I'll say eleven-eleven and take the odds;
"Forty-four of course will be the year,
"So on that date we'll give a h—— of a cheer."

The mechanical giant below isn't a new kind of tank but will help win the war just the same. Insulation bushings like these are required for huge transformers in a Western power plant. (G-E photo)



"We are rapidly mobilizing our productive strength and will soon overtake the Axis nations in that most important phase of warfare. Our American soldiers in particular and the allied soldiers in general are proving themselves readily adaptable to the rigors of combat, which together with superior fighting equipment make them better fighters than Germans or Japs. Italians have ceased to be a factor in my estimation. Our superior economic resources and the more wholesome attitude of our manpower developed under democratic influence are factors against which the Axis cannot long compete after we reach 'mid-season' form. This contrast will become more pronounced through breakdown of morale among Axis people and possible political collapse in Germany."

Early 1945:

"It will take us two years, in my opinion, to reach the top of our fighting strength. The Allies will do well to hold their own on the various fighting fronts with all the help we can give them in the meantime. Assuming Japan and the Axis powers fight it out to the last ditch, it will take our forces two years to conquer them, with all the help our Allies can give us."

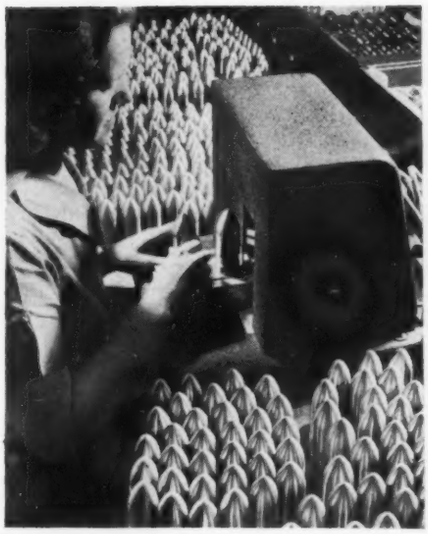
"By the end of 1944 this country should be properly geared for a real war with a large, well-manned army, properly equipped to meet any opposition, together with a two-ocean navy that should force our enemies to surrender by the middle of 1945."

"If all the tremendous supplies of war materials we are now turning out and the men who are being trained could be immediately available at the fighting fronts it would undoubtedly shorten up the time very greatly. The necessary ships to transport these essentials cannot be quickly built and until these are available it will most certainly prolong the war. To transport an army of two or three million men and the necessary equipment and supplies will undoubtedly tax the shipbuilding facilities of the country for the next two years. After that it shouldn't take long."

Fall, 1945:

"The United Nations will get stronger. None of us knows what strategy is planned, but each of us is confident our military leaders know what they are doing. Eventually they will compel Japan to shorten up her lines. We'll drive Japan back to her own islands within two years. Japan will be able to hold out there for another year, but the strength of allied assaults in the summer of '45 and the condition of her people will mean surender about the time that summer is ending.

"Japan's people haven't any 'morale'



This girl used to test refrigerator parts and other domestic devices, under a peacetime economy. Munitions for war now employ her skilled fingers in a converted factory. (Westinghouse photo)

chiefly because they don't know what the word means. They've got to take whatever they're told to take. But living conditions there are very bad now; they will get worse. And history will repeat itself—no leadership, no matter how determined, has ever been able to hold out against a starving people, or to keep a people fighting when all possibility of victory has obviously vanished."

Sometime in 1946:

"The war termination is contingent upon the United States' ability—in terms of time—to accomplish two things; namely, (a) fulfill its commitments under the role 'arsenal of democracy' and (b) during that process reserve for itself sufficient shipping and war materials of all kinds to wage offensive war on the basis of 'calculated risk' and to train and disperse adequate forces. Meanwhile, Russia will succeed in stalling Hitler next winter; Germany will begin visible collapse in 1943-44 under effective Russian resistance and offensive and the establishment of a second Allied front. Complete capitulation of Germany will follow in 1945. However, Japan will continue to fight and it will require at least another year to vanquish her."

"This will be a war of resources, particularly in the matter of critical materials, and past events have increased the resources of our enemy tremendously. Until such time as the Allied forces can bottleneck these resources and curb their production rate, the Axis powers may be able to continue the struggle."

"My reason for this opinion is the widely scattered island strongholds of the Japanese and the very extensive conquest which they have made already would appear to require a considerable period to overcome. Furthermore, American philosophy of life is so widely different from that of our enemies, particularly in respect to the brutal methods which they use in making war, that I fear we cannot acquire the necessary determination until we have had to suffer more horrors of modern warfare than we have to date."

"After the defeat of Germany in 1944, it will require two years of blockade by the United States and British fleets plus continued bombing of Japan to force her surrender. It is not probable that the Japanese fleet will be destroyed, because it will retire to the almost impregnable Sea of Japan. Hence blockade and bombing will win the war."

"It is going to take us the rest of this year to get prepared to start an offensive, and then when we are ready, it is going to take time to transport and assemble the necessary material in the strategic places throughout the world. Meanwhile, the enemy will be able to consolidate his position to such an extent that it will take much longer for us to dislodge him than it did for him to occupy the territory. I have no doubt as to the ultimate outcome, but it's a slow process wearing down the enemy. This is a war of machines and not so much of manpower, and when we are starting from scratch it takes a lot of time to accomplish our purpose."

"I believe the war with Japan will end during the winter of 1946-47, approximately five years after Pearl Harbor. Germany will be defeated before that time, possibly by the Fall of 1944. She will crack in the winter '43-44."

Sometime in 1947:

"It is evident now that our enemies made such thorough plans during the last several years, not only in their own countries but in the Pacific Islands and have gained such an additional amount of territory, that even after we are well prepared (which authorities seem to feel will be about the middle of 1943), it will take us a long time to regain the ground which has been lost."

"Several weeks ago I expressed myself in saying that it would take us three years to get into production, where we can come close to meeting our opposition, with one year more to stop the opposition and another year to 'mop' up. The reason for this opinion is possibly based on the average way in which we undertake problems of this kind, and the operation of the mechanics of a democracy. We will probably have to be licked pretty badly before we settle down and really direct our entire effort toward accomplishing the ultimate goal of winning this war."

"WHY I LIKE MY JOB in the

A contest open to all employees of Class A members of the Pacific Coast Electrical Assn., brought 421 entries to judges Al C. Joy, advertising manager, Pacific Gas and Electric; Agnes Barrell, advertising counselor, Northern California Electrical Bureau; and W. A. Cyr, associate editor, Electrical West, from which to select eight winners. The judges with great difficulty selected "bests" from such uniformly excellent entries, finally narrowed down to those on this page. Among them are two winners of last year's contest, Miss Smith, and T. E. Cooke. Each received a $50 war bond instead of a trip to the convention, cancelled this year.

Lucille Villar

Southern California Edison Co., Oxnard

In ordinary times, the electrical industry and particularly a public utility, deals almost exclusively with the commodity of service, and, to be employed in a company devoted to such a useful and necessary contribution to the well being of the public gives its own satisfaction. In wartime, when this service becomes the energy behind the manufacture and production of many goods vitally needed and regularly supplied, from bean to bomber, then do we realize the extraordinary usefulness of our industry.

What manpower is to an army and navy—electricity is to industry and agriculture behind them. For the reasons a man is glad to be a soldier or sailor, I am glad to be part of the electrical industry.

As I am proud of our American way of life, the convenience and privileges it recommends and provides, I cannot help but be proud and glad to work for an industry that contributes so much to this way.

A. Stanley Clem

Southern California Edison Co., Santa Barbara

I like my job in the electrical industry because it has proven the medium through which I have learned the difference between salary and service.

Unless one foregoes eating and sleeping under shelter, a salary can rightfully be called an essential remuneration for any job. But one thing no amount of salary can buy is the personal satisfaction accompanying the rendering of a genuine service to others.

My job is to sell domestic electrical appliances. My opportunity is to bring into hundreds of American homes a better way of living through the use of these appliances. I have given leisure hours to many, better health to others. I have created safety where hazards existed; have offered cleanliness in place of dirt, economy instead of waste, and ease instead of drudgery. My job has afforded me the rare pleasure of rendering service not only to the company for which I work, but to the customers which it serves.

T. Edmund Cooke

Southern California Edison Co., Pomona

I like my job in the electrical industry because I didn't have to know a politician to get it and because I do have to stay on my toes and produce, to keep it. It's a job worth the effort, and with the future limited only by the extent of my abilities.

The policies that govern my company are the right kind of policies and through the years they have enabled me to face my mirrored self at the morning shave without apologies for those things done yesterday and with no sense of dread for the day just beginning.

I like knowing that each pay check has been honestly earned and I like the feeling of security in the knowledge that the product of my company is a necessity in the lives of our customers.

Yes, even after twenty years, I *still* like my job in the electrical industry.

W. E. Smith

Southern California Edison Co., Monrovia

I like my job in the electrical industry because I feel that I am doing my part to bring comfort, health and prosperity to my country by furnishing economical light, heat, and power without destroying any of its natural resources.

Its dams for water power not only protect the valleys below from destructive floods, but makes irrigation water available throughout the summer when most needed.

It helps in keeping forest fire loss down by means of its private roads, telephones and personnel.

When I see a power line stretching across a forbidding desert waste and out of sight I feel proud that my company is doing its bit in helping to bring many comforts and means of making a living to those in out of way places.

The electrical industry has always been most generous and just in all of its dealings with employees. It furnishes the best of care in sickness and accident, and has pensioned those beyond the age limit.

Electrical Industry"

Though winners happen to have come from power company contestants, entries really represented the entire industry: California Electric Power 17; Coast Counties Gas & Electric 2; General Electric 6; General Electric Supply 3; Graybar Electric 11; Incandescent Supply 1; Pacific Gas and Electric 46; San Diego Gas & Electric 11; Southern California Edison 316; Westinghouse Electric & Mfg. 1; miscellaneous entries in contest with no company affiliation, 7.

Russell J. Owen

Pacific Gas and Electric Co., San Francisco

I like my job in the electrical industry because I am participating in the distribution of that electrical energy which has contributed more to progress and prosperity than has any other product in the history of this world. I am a member of an industry that requires the faith of investors, the skill of great engineers as well as the loyalty and intelligence of thousands of workers. The officers of this industry are men whose ability has advanced them to their respective positions; such men are a living inspiration and serve as a constant reminder that here proficiency is recognized, and that our opportunity is limited only by our ability and will to succeed. The progress of this industry is a living example of the economic security for which we all strive. I serve in this electric industry with pride.

Juanita Bean

Southern California Edison Co., Alhambra

I like my job in the electrical industry because . . . it has contributed more to mankind than any other. It permits me to contribute to mankind—through service—a better standard of living.

That makes me proud.

It is solid, secure and respected. The leaders of my industry are the leaders of our communities and our Nation.

That makes me proud.

It took Americans, with their ingenuity, daring, faith and vision to develop electricity to achieve for us Americans, the finest standard of living in the world. Possibly the greatest development of the industry has been done in *my* generation.

That makes me proud.

Its future is infinite. The Four Horsemen of the Apocalypse are now riding. When the race is over, my industry has a job to do. We will spread our Good American LIGHT to all the dark corners of the world.

That makes me very proud.

Ma Belle Smith

Pacific Gas and Electric Co., San Jose

I like my job in the electrical industry because—it's . . .

. . . enjoyable!—Pleasant employee associations and surroundings of the highest type make it so.

. . . exciting!—for example—Prospective customers inquire about service . . . and by taking a personal interest in explaining extension policies . . . low cost service . . . appliance care, I make friends for myself . . . and for the industry . . . because to them I *am* the Industry.

. . . stimulating!—How? . . . By working with far-sighted . . . keenly alive men and women, who are always "looking ahead", constantly seeking and finding new and better ways of rendering better service.

. . . fascinating!—for electricity itself is fascinating . . . "mysterious" . . . yet practical.

It can't be seen . . . or heard
but
can be measured . . . controlled—
—that's what the "experts" know.
This is what I know:
It saves
. . . time
. . . steps
. . . food
. . . money
and . . .
. . . lives.

It's the most vital necessity for home comfort and health, and industrial and commercial progress . . . Electricity's human! . . . almost.

You'll trade jobs with me? . . . Oh, no you won't.

H. L. Moore

Southern California Edison Co., Santa Monica

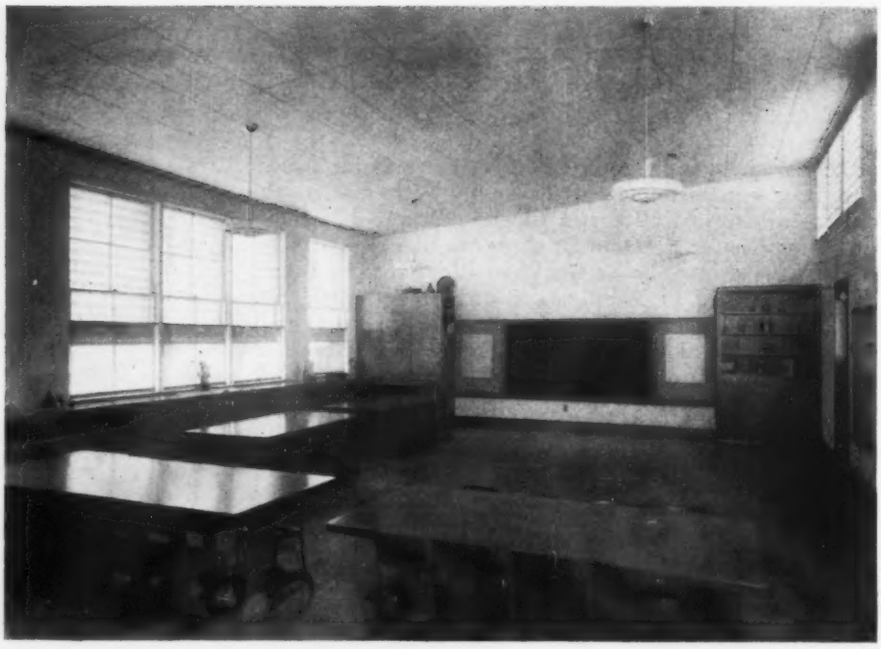
An old and well established industry offers security to its workers. A new and growing industry offers adventure, and chance for personal progress and gain. In the electrical industry these two elements are combined. It is old enough to be well established, but it is constantly being rejuvenated by new developments, new inventions and new methods. These changes offer a challenge to the individual and give him an opportunity for growth, development and advancement.

Those of us who work for the electrical industry are doing important work. Ours is an industry which is essential in time of peace, and a foundation for victory in time of war. There is a thrill in being a part of such an organization.

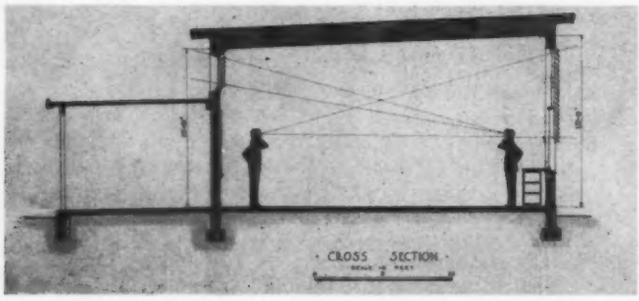
To me the sight of steel transmission towers, holding their power filled lines to the skies, is the insignia of the twentieth century and the promise of a better world to come. I am glad to have a part, however small, in making that promise come true.

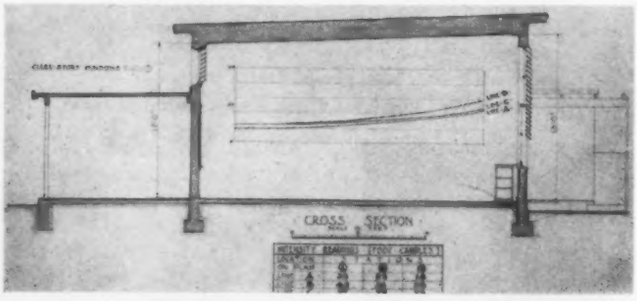
Brightness Control

Ideal school lighting calls for it, as well as supplemental artificial illumination

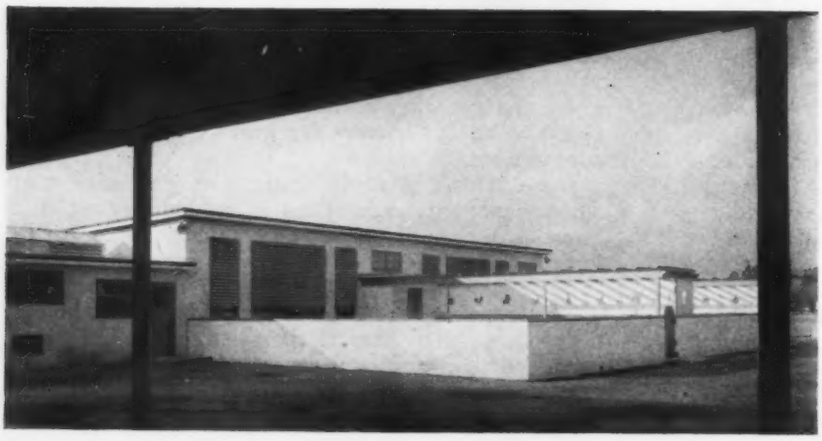


Fixed louvers outside windows, and inside of clere-story windows (see diagram below) prevent seeing of sky brightness, yet roller blind raised at bottom of windows permits teacher to supervise children in outdoor classroom while inside with other children. Eye-level outdoor brightness is low viewed through lower window only against walls and trees





SINCE his article on school lighting in the January issue, p. 53, curiosity has been expressed as to what kind of lighting Charles D. Gibson, superintendent of schools, Mountain View District, El Monte, Calif., meant. In the Jenny Tucker Baker School, illustrated and diagrammed here, the principles involved to control brightness contrast, as well as to supply electric illumination, are shown. It *was* designed by architect, illuminating engineer and school superintendent, not for lighting alone, but as part of a complete health environment program. Maximum use of natural light demands control of brightness, but not left for a busy teacher to control manually. Instead, fixed louvers at windows and at clere-story windows, give maximum ceiling distribution. Longer-than-ordinary stems on lighting fixtures distribute artificial light more evenly from six 500-watt fixtures, photo-cell controlled. Only lower window section is left for teacher to control shades. These windows face buildings, trees, etc., which reduce outdoor brightness. Diagrams illustrate layout, points at which foot-candle and foot-lambert readings were made, lines of vision, foot-candle levels. Foot-candle readings in daytime ranged from 45 maximum to 18 minimum; brightness from 600 ft.-lamberts at center of windows, to 5, at center of dark brown writing board.



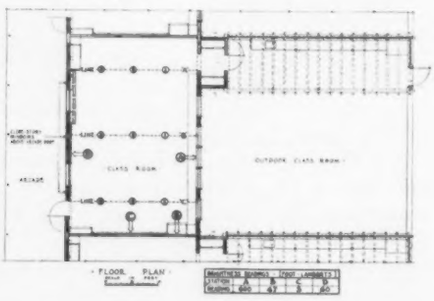


Diagram above shows plan arrangement of room and outdoor classroom. Brightness readings at extremes show that 13-to-1 is worst possible in the ordinary line of vision

New Job for Sales Staff

REVISING activities of a peacetime utility sales program to meet needs of the war was not an easy task. It required an antidote to meet ebbing morale of the salesmen. It meant strict compliance with the government non-selling requirements. Furthermore, justification of a sales organization demanded that the company receive some benefit. institutionally and financially, and that the program be sufficiently plastic to change overnight if conditions warranted.

Announcing, as the Washington Water Power Co., Spokane, did in January, that "load building and the sale of merchandise was ended for the duration," the general sales staff watched with considerable apprehension the fact that sales morale had reached a new low. No one could be blamed. The war had upset everything.

Some aggressive sales employees had attempted to find work elsewhere, thinking that the utility sales organization needed only the spade and a few daisies to place it entirely at rest.

Other men, who held long-time employment records with the company and who wished to retain their contacts, reported for work each morning, but they marked time during the day and little was accomplished. A few prominently conscientious, openly stated that they were ashamed to draw pay without earning it. "We are frittering our time away with nothing to sell," they said. Supervisors stated that during a high point of uncertainty less than 10% of the men were at work. Like good sailors suddenly tossed into a cold sea, they were floundering without chart or compass.

Inquiry into the salesman's mind revealed that he was willing to work and was capable still. The trouble seemed to be, first, that being a salesman, he demanded tangible results in each interview. He was used to getting things done and the war situation had taken from him all tangible milestones by which to measure progress. It wiped out all order taking.

Second, the war had damaged the salesman's sense of importance. Selling seemed to have little encouragement from the government, or from patriotic customers. The salesman felt that he was a hindrance to war effort.

The problem of the Washington Water Power Co. then was threefold. Sales management must restore the salesman's feeling of importance and responsibility. It must orient the salesman in the war situation and give him a direction to travel. And third, it must provide psychological hurdles so that after each customer interview, and at the end of each day, he could have the mental satisfaction of having accomplished something in a battle of wits.

The new program was called the Victory Campaign—to help win the war. It informed the salesman at the outset that on the home front thousands of customers required specific help in the care and use of appliances. The war made this revenue sustaining feature important to the company as well. Also, the company had pledged all its effort to support the war program, and regardless of differences that may exist in the nation's political and economic field, everyone agreed that national unity was essential to winning the war. Salesmen were told that they had an important task in promoting national unity. Each man became an ambassador to support the job of winning the war.

Some salesmen found it difficult to abandon a life-long habit of taking orders. Changing their title from salesman to "neighborhood representatives" helped some. Requiring that each man announce at every customer's door that he "had nothing to sell," helped more. In defense areas where an influx of workers demanded housing and equipment, and where specific questions were asked regarding electrical equipment, the company representative was expected to refer the customer to local dealers.

Other duties were as follows: the customer representative was supposed to advise customers as to the use, repair and maintenance of appliances. He was expected to gather information of statistical, or opinion nature which would be useful to the company now and after the war. He was instructed to discover appliances not in use in the customer's home, so that this unused equipment may be a source for other customers. He talked patriotism, advised against waste, encouraged health and a fuller appreciation of electric service.

Complete customer coverage was anticipated in this program, and the customer approach was based on a prepared questionnaire patterned after a market survey.

Each customer representative made at least ten calls per working day, and if for any reason he failed to turn in at the end of each day at least ten completed questionnaires, the blanks remaining for completion accumulated on his hands, and had to be eventually completed before the week in process ended. His assignment being thus definite, the salesman discovered that it did not pay to get behind with his work. It meant night calls before the end of the week.

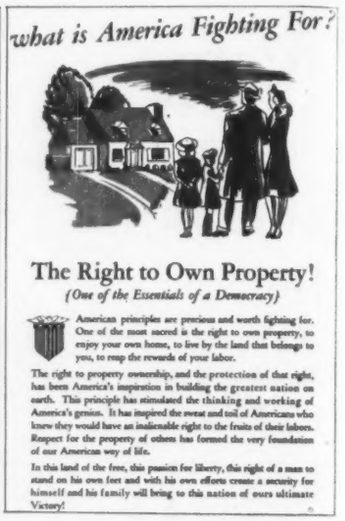
Naturally, the salesman was warned that he must not attempt to dictate or color the customer's answers to his questionnaire. No discussion should be carried on while the survey was being made. Accuracy was important at this stage of the interview, because the cus-

To fit a peacetime organization to wartime economy, Washington Water Power Co. has launched a revised sales program, which puts salesmen to work as "neighborhood representatives". Aid in the solution of customer problems brought on by the war and furthering good customer relations are key objectives; a questionnaire and a booklet "What is America Fighting For", are important tools in the new set-up. At right, Jack Hanguar, Spokane sales supervisor, checks the program's effectiveness in an interview with a customer previously visited by a salesman. Outstanding performance is recognized by material awards

what is America Fighting For?
The advertisements reprinted in this little pamphlet are of a series currently being published by The Washington Water Power Company. They attempt to set forth in specific terms some of the basic American freedoms, the preservation of which is fundamental in America's all-out war against the dictatorships.

what is America Fighting For?
Freedom for the Future!
(One of the Essentials of a Democracy)
The Liberty Bell enshrined in Independence Hall symbolizes the first successful fight by Americans for the right to plan their own lives . . . the right to build their own future.
In America—and only in America—every citizen can set his own goal with the right to work toward it unhampered by any system of caste or class . . . serene in the knowledge that he and his loved ones can ultimately enjoy the peace and security his labors have won.
Freedom of the future—the right of every American to earn his living as he chooses—to gain and hold success through his own initiative, careful planning and hard work. To many peoples of this earth that is only a beautiful ideal. In America it is a reality—a reality worth fighting for hard, as long as it may take, until Victory!

what is America Fighting For?
BOY WANTED
Equal Opportunity for ALL!
(One of the Essentials of a Democracy)
Deep in the breast of every American boy flames the light of hope and ambition. Equal opportunity to "make his mark" is one of the many American principles our country will ever fight to protect.
American fathers have shown their sons that—in our country—individual initiative has brought success time and again. Throughout our country's history, the thousands of great Americans, who, by their own efforts, raised themselves high in America's state, professional and business life repeatedly illustrate this truth. In America—as nowhere else—every boy, rich or poor, has that cherished privilege of making his life worth while in the field of endeavor he chooses!
Equal opportunity for all . . . the American ideal of free enterprise . . . the American way of life! Those things have made America great. Those principles will see America through to Victory!


what is America Fighting For?
The Right to Own Property!
(One of the Essentials of a Democracy)
American principles are precious and worth fighting for. One of the most sacred is the right to own property, to enjoy your own home, to live by the land that belongs to you, to reap the rewards of your labor.
The right to property ownership, and the protection of that right, has been America's inspiration in building the greatest nation on earth. This principle has stimulated the thinking and working of America's genius. It has inspired the sweat and toil of Americans who knew they would have an inalienable right to the fruits of their labors. Respect for the property of others has formed the very foundation of our American way of life.
In this land of the free, this passion for liberty, this right of a man to stand on his own feet and with his own efforts create a security for himself and his family will bring to this nation of ours ultimate Victory!

tomer's answers would determine what was to follow. Statistical and customer opinion questions found in the questionnaire include:

1. "Do you have any electric appliances in your home that need repair?
2. "Do you happen to know what rate you now pay for electric service? (Circle the amount stated) 1c—2c—3c—4c—5c—6c—7c—8c—9c—10c.
3. "A great many people will probably find it difficult to buy electric appliances in this area. Do you have any electrical appliances in your home you will be willing to sell?
4. "If an air raid occurred tonight could you blackout your home so that normal household routine could be continued?
5. "After the war ends, do you expect to add more appliances to your home?
6. "I now place before you two newspaper ads. Do you remember having seen either one before?
7. "Do you believe company electric rates are as reasonable as government rates would be?"

On the back of the questionnaire the salesman was expected to give age, income level, sex of the person interviewed and the progress he made with his discussion. After that he was instructed to put the questionnaire away, and to dismiss it from the customer's mind by talking about the war. Obviously, the customer's answers were perfect cues as to what turn the interview would take thereafter. Certainly the salesman could not be so tactless as to use the information he had received as a basis for contradiction and argument.

The more subtle procedure suggested that he hand her an attractively prepared booklet, the pages of which discussed the use of appliances in time of war, and also discussed the various freedoms this nation is fighting for, including free enterprise. Naturally the salesman would not hand her the booklet and depart, but would use it as a visualizer, turning it page by page, and casually dwelling on any one topic that seemed important.

"Take good care of the things you have" was one of the booklet page headings. "How to store food in your refrigerator" was another. "Hints that will save in home laundry," "Better lighting for eyesight conservation," "Thrift hints worth remembering about your electric water heater," "In case of blackout," "What to do if a fuse blows out," "What you pay for electric service," "What is America fighting for?" etc. The salesman used his own judgment as to whether or not he discussed all topics, or none at all. No canned sales story was this to be requested ten times every day, but a flexible pattern adaptable to the customer's needs, and predetermined by the survey.

But the purpose in making a customer call was not to fill out a questionnaire, though statistical data would prove valuable. Nor was the salesman's purpose to hand out a pamphlet, which in itself would probably be circulated to other members of the family with definite good. His true object was to discover customers who were in the doubtful column regarding any one of the company's objectives.

Here he was in the customer's home with full knowledge of what stand the customer took on various issues. In a gentlemanly way, using all his skill as a salesman, his job was to convince the customer to a favorable, positive attitude.

After the interview, each neighborhood representative was required to make an appraisal of his own progress in these matters. It was a question of honor and judgment. If no progress was made, he was expected to say so. His mental satisfaction was supposed to come as a result of success in changing people's minds. The formula seemed to work.

Salesmen like the program, its flexibility, its definiteness, its way of giving them an insight into the customer's thinking. As a result, Washington Water Power salesmen really got down to work.

Supervisors and sales managers were required to give a monthly report showing the number of calls made, appliances available for future use, appliances needing repair, and progress with objectives. This report also required that the supervisor make spot checks from time to time of the customers already called on by the salesman. His approach was simple, and direct. "Mrs. Jones," he said, "I am Mr. Blank of the local electric company. The war has made it necessary for us to carry on a new type of program, and I am trying to find out if it is effective. The other day our neighborhood representative called on you. Will you give me your reaction to his call. For instance:

1. "Do you remember the name of the representative who called?
2. "Did he leave any pamphlet with you? Do you remember what it was about?
3. "Do you happen to know what rate you pay for electricity?
4. "Do you receive full value for the money you spend for electricity?
5. "Do you remember what he said regarding the subject, 'What is America fighting for?', etc."

If the salesman skimmed over essential objectives, it did not take the supervisor long to find it out. A private conference with the careless sales person was not welcomed a second time. Anyway, with no premium on quotas, there was little inducement for the salesman to misrepresent the outcome of his interview. There was not much advantage gained by fooling himself, especially when the supervisor's check-up hinted that he might be considered dishonest or outright dumb.

Compensation for the duration of the campaign was frozen. Occasional salary raises are expected, according to R. B. McElroy, general sales manager, but they will come as a result of outstanding performance. The salesman's performance is summarized each week

in report form, and such items are included in the report as:

1. Articles read by salesman pertaining to his work.
2. Talks he has made before clubs, groups, etc., in the interest of the industry.
3. Meetings attended.
4. Customer calls other than survey calls.
5. Future appliance needs of the customer referred to the supervisor.

Special recognition will be made each month to the salesman in each division who does the outstanding job. To assist the local sales manager in making this decision, a secret ballot of his staff of workers may be taken and the popular vote compared with the performance record of each man. No man can receive recognition until a written recommendation is submitted to the general sales manager and approved by him. This prevents local marble trading. Once the nominee for honors is approved, however, material award is given and the man is publicized in company house organ, bulletin boards within the organization and in local newspapers.

Extremely interesting have been the results of the first several thousand customer contacts. The advertising department learned that too few people were looking at its ads, and serious thought is being given to the problem of greater readership.

The sales promotion department learned to what extent people were anticipating the purchase of appliances after the war, and what these appliances consist of. Management learned customer attitude toward the firm, and to what extent the past story of low rates had been assimilated. War workers learned that more information is needed on subjects of blackout.

Seventy-seven in each hundred were able to blackout their homes. Six in each hundred had an appliance they were willing to yield to someone more needy. Six in each hundred had an appliance that needed repair. Eighty-six in each hundred had no definite idea what rates they paid, when the company has publicized its rate as one of the lowest in the nation for many years. In addition, the average salesman discussed the customer's use of appliances in time of war, talked about company low rates, and emphasized the American way of life. Not bad for a typical sales call!

"The program is no panacea," comments Kimball Jack of the advertising and promotion department, who designed the procedure, "but it does succeed in getting the men to work. What more can one expect from a good salesman?"

Wartime Promotion*

By James Lightbody
B. C. Electric Co.

A few concrete suggestions on the course advertising might follow:

1. Promote the proper maintenance of appliances. This should be linked up with a readily accessible repair department. Such a department might be brought to the front of a store like some of the shoe renew shops. A great deal can be done toward educating the public on how to lubricate and look after their appliances. This was always desirable, but at a time like this it would fall on more interested ears. There is room for a comprehensive booklet on this subject.

2. Let us sell such materials as we can obtain including switches, cords, sockets, wire, black tape, and so forth for home repairs. This may seem a small matter, but it will keep the idea of appliances alive, and is good for store traffic.

3. Let us continue to give home service on cooking, refrigeration, canning and so forth. Food shortages and war nutrition are vital subjects these days and by issuing bulletins and giving advice along these lines, we can do a good job for our companies' goodwill, and at the same time keep our major appliances sold.

4. Let us back up the blackout arrangements by giving advice on how to blackout and at the same time maintain good lighting which is so necessary for morale.

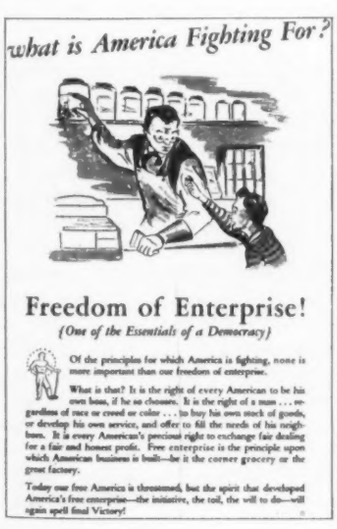
5. Where new service cannot be given, as in rural districts, let us explain the reasons. This may seem like a negative approach, but it makes electric service all the more desirable because it cannot be obtained and incidentally keeps electric service sold.

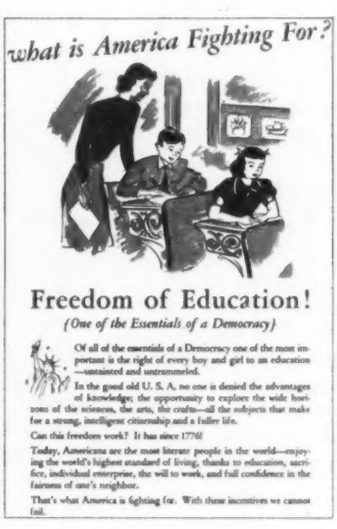
6. If wiring materials are difficult to obtain, it may be necessary to suggest temporary expedients for new homes, but we should at any rate see that main switches and supply lines are adequate for the future.

7. We may need either to assure our customers that there is no shortage of power anticipated, or to ask for their conservation of power. This will depend entirely on our local circumstances, but whichever way has to be adopted, it can be used to keep electric service sold.

I should point out that advertising deals with many delicate psychological characteristics and that it is unwise and often impossible to approach a problem as directly as a salesman might approach a prospect. Advertising achieves many of its purposes by subconscious effects. The secondary effects of an advertisement are often the most important. Further a single advertisement should not be considered by itself but as part of a continuous program.

* From an address before the joint convention of the Canadian Electrical Assn., western division, and the Northwest Electric Light & Power Assn. at Vancouver, B. C.


what is America Fighting For?
Freedom of Enterprise!
(One of the Essentials of a Democracy)
Of the principles for which America is fighting, none is more important than our freedom of enterprise.
What is that? It is the right of every American to be his own boss, if he so chooses. It is the right of a man . . . regardless of race or creed or color . . . to buy his own stock of goods, or develop his own service, and offer to fill the needs of his neighbors. It is every American's precious right to exchange fair dealing for a fair and honest profit. Free enterprise is the principle upon which American business is built—be it the corner grocery or the great factory.
Today our free America is threatened, but the spirit that developed America's free enterprise—the initiative, the toil, the will to do—will again spell final Victory!


what is America Fighting For?
Freedom of Education!
(One of the Essentials of a Democracy)
Of all of the essentials of a Democracy one of the most important is the right of every boy and girl to an education—untrained and untrammeled.
In the good old U. S. A. no one is denied the advantages of knowledge; the opportunity to explore the wide horizons of the sciences, the arts, the crafts—all the subjects that make for a strong, intelligent citizenship and a fuller life.
Can this freedom work? It has since 1776!
Today, Americans are the most literate people in the world—enjoying the world's highest standard of living, thanks to education, sacrifice, individual enterprise, the will to work, and full confidence in the fairness of one's neighbor.
That's what America is fighting for. With these incentives we cannot fail.

what is America Fighting For?
Freedom of Religion!
(One of the Essentials of a Democracy)
In America, Faith has no limits. America believes in and hallows the religions of the world.
To Americans, the right to worship as they choose is as fundamental as the right to own their own property, or to choose their own life's work. But to our enemies, America's way is intolerable. The very precepts upon which our American life is built are the things they seek to destroy.
Faith and courage . . . initiative and honest sweat . . . a passion for liberty and justice and equal rights for free men—those are the seeds from which the American way of life has sprung.
Today, America's Faith is undaunted. The light of freedom burns indelibly in the hearts of free American men, fighting today until Victory!

what is America Fighting For?
Freedom of Speech!
(One of the Essentials of a Democracy)
Freedom of speech is but one of the many important rights America is fighting for today!
Our free speech is as American as Valley Forge. Fostered by our Pilgrim Fathers, it was protected by the life-blood of the Colonials and finally written into the Bill of Rights as a sacred, inalienable right of the American people.
Lose it now? Never! To us freedom of speech is still worth fighting for. Like individual initiative, free speech has helped make America the greatest nation in the world. It took courage, foresight, and hard work to build the great private business enterprises that have made America's standard of living the highest in the world. And those same qualities—personal sacrifice, hard work, individual initiative—will again make America victorious in this fight for freedom!

What Can Dealers Do?

By
J. CLARK CHAMBERLAIN
Manager, San Diego Bureau

ANY dealer with average perception has known for many months that the course of his business would have to be radically changed this year, if he expected to survive. Last fall the trend was obvious. Gradually we were to see a pinching down of our sources of appliance supply, and none could doubt it.

Difference of opinion existed then as to how soon actual shortages might be felt by the dealer. Some of this difference of opinion still exists, for a surprisingly large number of firms have generous stocks on hand, and the flow of appliances from factory sources has not been stopped.

Only the most stubborn, however, would argue that what once was a steady flow is now not more than a trickle. Death sentences at the manufacturing end have convinced the diehards that it won't be long now. Even generous stocks may go in a few months of frenzied buying such as has been lately experienced.

Stores in the San Diego area have been particularly far-sighted in building up stocks over the past nine months, and this probably accounts for reasonably heavy inventories now, on the average. But at the same time we have not been blind to the trends. Only a very few actual casualties among dealers have occurred in this county so far, but every one in the business realizes there will be all too many go by the boards later on, unless the protective moves being considered and undertaken are successfully put into operation.

Need for a Conference

We have believed for months that there is no uniform panacea for the preservation of at least a good nucleus of those firms who have been doing the bulk of the appliance business in our territory. What might fit one case would not apply in others.

Service, long talked of as a cure-all, has loomed importantly to us but by no means a sure-fire method of salvation. With such ideas in mind, and after having listened patiently to the viewpoints of most of the dealers here, we decided to undertake the planning of a conference or forum to which all types of appliance men might come for guidance and the exchange of ideas.

Finally, this Appliance and Service Conference, so-called, was held, Apr. 29, with full afternoon and evening sessions programmed for owners and executives only. About one hundred were present. The conference had been planned to develop the exchange of ideas by encouraging participation of as many dealers as possible, and happily a large number of those present took part in the discussions.

The first topic was based on the question, "What are some of the qualifications a dealer should have to insure his chances of remaining in business successfully?" Many opinions came from the floor, but here are some of the most commonly accepted observations:

What a Dealer Needs Now

He should have a service department now, with reasonable facilities for possible expansion. Preferably he should himself be able to do some service work; at least he should have sufficient background to administer the details of an enlarging service business. While there was some disagreement on this point, most of those present felt that without some active background and present clientele, it might be difficult to work over into a profitable operation of this nature, when diminishing appliance stocks would demand it.

Store location appeared to be an important factor. It was pointed out that while major appliances have been successfully sold in many stores having secondary or even remote locations, this probably will not be the case when substitute merchandise will constitute a major part of sales. Then, store traffic will become increasingly important.

The layout of the store, its size, arrangement and adaptability to gradual change to other lines was accepted as having some bearing. The possibility of the owner or his key men being called for selective service was mentioned as a factor. Financial condition, too, was considered. There were other points upon which the general thinking seemed to agree largely but those outlined above were the principal ones.

What of Substitute Lines?

After having covered this subject, the next taken up had to do with "substitute merchandise or equipment." To begin with it was the consensus that even with appliance stocks that might last several months, the dealer who seemed to have suitable qualifications, plus the will to battle it out, should begin at once to handle some of the things he ultimately must rely upon.

At once, illustrations of such businesses that had already made these moves commenced to be offered. The willingness of men to discuss frankly what formerly might have been classed as extremely personal business matters was surprising. At first it did take a bit of prompting to prime the pump, but once started the "testimonials" rolled in one after another and were only halted when the gong finally sounded for the next subject. Time had previously been allotted to the several parts of the conference and the limits were adhered to as closely as possible.

The testimonial and question method quickly developed the point that what might work or had worked for one type of store would not necessarily work for another. And here again, such factors as location and clientele had a bearing on the conclusions.

Generally speaking, it was found that with any sort of store traffic dealers could profitably sell most of the things with which they had experimented. Here are some of the products (frequently handled in combination) that were testified to as having already proved successful in the hands of San Diego county dealers:

> Photographic supplies; garden tools; sprays and insecticides; commercial fertilizers; potted plants; bedding plants and roses; cleaning and polishing oils and compounds; waxing outfits; decorative candles and other petroleum base products for the home; woodenware; kitchenware; synthetic table cloths, shower curtains, food bags, etc.; plastic ware; carpet sweepers; bathroom scales; wooden ladders and stools; ironing boards and covers; revolving clothes lines for outdoors and portables for indoors; many lines of pottery and glassware; gift articles; furniture; clothes hampers; paints; sporting goods; work clothing, etc., etc.

Those having such experiences were unanimous in the opinion that it takes time for both dealer and customer to get used to changes of this sort, and therefore it is of highest importance to start the changeover before appliance stocks have dwindled. This way, potential or actual appliance customers furnish immediate prospects for present and future sales of what will some day be the principal stock in trade.

In this connection, it was unanimously agreed that store traffic stimulation constitutes one of the most important cooperative activities that might be undertaken now. Examples of this were the 1942 Bureau sponsored waffle, refrigeration and toaster booklets

with recipes, introduced by individual advertising promotions. Under this plan, recipe and idea booklets as indicated are prepared for customer use. Through the means of suitable window cards and backed with substantial advertising, free copies of the booklets are offered by calling at any appliance dealer's store.

Spaced at intervals, these activities have done much to maintain the public's interest in our appliance stores. It is planned to continue them throughout the year in the knowledge that they will prove of much help to dealers by bringing additional traffic into the stores of this territory. Obviously, with the entire appeal built around the "use" angle, this constitutes a definite service to the customer as well as to the dealer, and when we are ready for it, will undoubtedly have a bearing on the development of additional appliance service work.

What About Service Work?

After having fully developed the possibilities of shifting an appliance store into other lines by gradual stages, the subject of "service" was introduced. In this discussion, all appliances except radio were considered. Because radio repair requires specialization and a separate problem existed here, the latter subject was segregated.

It had previously been agreed that service work, for those equipped to handle it, would constitute a substantial part of a dealer's business in the months to come. Our people, however, still think that the promotion of service as it is being done in most sections of the country has been premature. The majority here feel that with so much merchandise still available, the public may have been confused by such service campaigns. Furthermore, they feel that we have been in no position to carry more service work than our dealer shops have had during the past months.

They take the stand that as sales diminish and we are able to expand our servicing facilities from the standpoint of personnel and equipment, it will then be time to undertake aggressive campaigns to stimulate repair work. It is possible that our dealers may not be typical, but here every shop has had its hands full for a long time.

With the certain prospect of more money in circulation than goods to meet the demand, it may be assumed that service work will be very easy to sell in the months ahead. That is, if we build up sufficient facilities to handle it, and do so intelligently.

On this point, our conference developed many interesting approaches to the old theory of "selling up" applied to service. For example, it was shown that with very little effort complete refinishing of such major appliances as washers and ironers could be obtained while they were in the shop for overhaul, with considerable increase in the amount of the job involved.

It was quite generally observed that customers are not nearly so price minded about service now, as they have been in the past. Their attitude seems to be that this is no time for temporary or halfway reconditioning, and it is, of course, this feeling upon which the industry bases its belief that service really can be made to show a profit.

What About Parts?

The two principal problems that appear to face dealers, as indicated from the conference discussions, are those of parts and personnel. Considerable uneasiness has been felt here over the future supply of parts and maintenance materials. Assurances, of course, have come from the government as well as the manufacturers, that they will continue to make necessary replacement parts, but severe shortages in some instanees have cast doubt upon this certainty.

In the main, however, our people feel that by using every means of fabrication or substitution at our disposal, the parts situation will eventually ease up. As for personnel, this has become a common source of worry. The fabulous wages paid by local war industries make it extremely difficult to hold competent men in our service departments. The turnover is too high for best efficiency. This situation apparently applies to a number of organizations and the best answer to it seemed to be: meet the competitive pay of war industries if you can in an attempt to hold your best men.

Radio Service Especially

The entire subject of radio service was outlined during the conference, but due to the magnitude of the problem and to the fact that a tentative solution was in the making, no floor discussion was invited. Since the close of the conference the program under consideration has been adopted and is now in course of being established.

To visualize the situation facing radio service dealers one must be familiar with the reason for the alarming shortage of technicians in this territory. Beginning last fall, the government commenced to send out appeals for radio trained men for the rapidly expanding equipment of the military forces used in sound detection, communications, undersea work, etc.

Here again, very high pay and the urgent need for personnel on the part of the government commenced to make inroads. But the pressure of last fall was really only a breeze. Each month of the war has found the government upping its estimates of need for men with radio training. They have been taken by one means or another until at present the shortage of technicians to keep radios in repair has been felt in every shop of this territory.

And yet, we learn that this is only the beginning. Tens of thousands of additional personnel with this training must be brought into government serv-

San Diego Bureau advertising has centered on promotion of booklets, obtainable free from dealers and showing how to get the most out of electric appliances

Learn to do Tricks with a Toaster!
Draft your waffle baker, too!
FREE
BUREAU OF RADIO AND ELECTRICAL APPLIANCES
BUREAU OF RADIO AND ELECTRICAL APPLIANCES OF SAN DIEGO COUNTY
PHONE MAIN 2803

ice this summer and fall and the quickest way to get them is from the radio dealers! Sober estimates indicate that probably half of our remaining personnel will have been taken by the end of this year. At the same time, due to natural causes, the demand for radio service is increasing. We believe that by the end of December this demand will have been increased 50% in our territory alone.

The picture of our situation six months from now should alarm every person connected in any way with radio or the electrical industry as a whole. If this trend cannot be averted by somehow finding and training technician personnel not subject to government demand, we will surely face a situation here (and perhaps in most Coast areas as well) wherein it will take *weeks* for a customer's radio to be repaired.

Thousands of people will be without the use of their sets during long periods and everyone concerned — the user, dealer, parts jobber, manufacturer, radio stations, utilities and the government itself—will suffer for one reason or another. But we hope our program which has been developing for some time will prove a partial answer at least.

Vocational Training Program

This program involves the use of the vocational school facilities as a training center, after additional equipment and teaching personnel can be arranged to meet the situation. Through a series of conferences a program was agreed upon and is now getting under way.

This calls for the enrolling of three classes of potential technicians not subject to government call. They are: physically handicapped; middle-age men with some electrical or technical experience; and women with mechanical aptitude.

People from these divisions will be enrolled subject to certain qualifications established by our radio committee. They will be trained under a combination of theory and practice to become helpers, with a view eventually to working them into technicians. The plan calls for a minimum training period of four months, after which suitable personnel will be allocated to the shops most in need of replacements.

We do not overlook the fact that it has generally required a matter of years, not months, to fit men for radio repair work, so we shall not expect too much from so short a training period. However, in view of the alarming shortage of qualified people to take care of the ever increasing demand for this type of service, we feel we shall at least be making a good start toward solving this problem.

The final subject brought before our conference was that of "priorities" and obviously this could not be handled by floor discussions of our dealers. The subject is too confusing for even the experts of the government, one of whom did his best to clarify the many puzzling orders, regulations and other restrictions affecting appliances.

Questions Answered

It is not necessary to elaborate on the manner in which this part of the conference was handled, but it was considered one of the most valuable of the entire program. The average dealer knows all too little of what he may or may not do, legally, and we found it of immense help to have a competent WPB official present to answer our many questions.

This somewhat informal method of describing the dealer situation as it is shaping up in this territory might well be concluded with a few personal observations. To begin with, we will all agree that we must do everything reasonably possible to keep a good nucleus of our dealers in business throughout the war period, not for selfish reasons, but because the dealer, the manufacturer, the utility and the customer himself will all profit thereby.

The foregoing accounts of general plans and programs now being undertaken and contemplated here covers the situation pretty well, with one exception. Nowhere have we touched upon the tremendous importance of keeping up a closer personal contact with the dealers than we ever did before. Independent counsel and encouragement definitely mean more now than at any time in memory.

Personal Encouragement Needed

We find here that dealers are beginning to show the effects of the increasing weight of freezing orders, restrictions, regulations, price control, etc. Even many who appear to be ideally situated to weather the rough going ahead are showing dangerous signs of discouragement.

We must give every possible encouragement to such men. No one can laugh off the rapidly mounting burden of doing business the way the government asks us to, but by means of clarifying information on priorities, regulations, etc., by means of frequent visitation and by demonstrating a real interest in trying to help the dealer ease some of his burdens, we will be contributing much to the solution that means everything to the electrical industry as a whole.

This is no time to decrease dealer activities of a constructive nature. It's time to go all-out in an effort to preserve for the future, as much as we possibly can, what is left of our structure.

How Light Can Help

By C. T. BAKEMAN

Puget Sound Power & Light Co.

TO this question of the effect of fluorescent lighting on utility revenue and power factor, I think the most appropriate answer is . . . "so what?" Yesterday those things may have been important, but today the importance of everything is related to the one primary problem . . . winning the war.

Revenue, power factor and almost every other individual problem of the utility has little or no significance if we do not win this war. I would like to further amplify my answer "so what."

If the use of fluorescent lighting best serves the war effort, if it best serves the nation's interests and if it best serves the customer's interests, the utility's interests will be equally best served. This is true both selfishly from the point of view of revenue and cost of delivering energy as well as from the altruistic and patriotic point of view of best serving the public and the war effort. This statement is made after considerable experience and considered judgment.

Revenue

Let's take the matter of revenue first. Serving the customer's best interests with fluorescent lighting will positively protect the utility's revenue. Conversely if the utility loses revenue from fluorescent lighting, customers have had a poor bargain from it. If the utility gains revenue from fluorescent lighting, the customer will have a good bargain.

We can take any type of customer as an example. Let's use the case of a retail store. This store could be sold fluorescent lighting to save half of its lighting kwh. cost with no improvement of qual-

* Summary of address before the joint convention of the Canadian Electrical Assn., western division, and the Northwest Electric Light & Power Assn. at Vancouver, B. C.

ity or quantity of lighting delivered. This would mean on the average the net saving of 20c for each $100 gross sales volume or about 2/10 of 1%. For this saving it would have to make an investment of about $2 for each $100 of gross sales and it would take it 8 to 12 years to pay out this investment. In this case the utility loses revenue and the customer has a bad bargain.

On the other hand, suppose this retail store doubles its lighting with a fluorescent installation without attempting to save kwh. costs. Actual tests prove that if this lighting is well designed for the purpose, this store should expect from 5 to 15% increase in gross sales from this improvement. If it only obtains 5% increase, this would mean $5 in gross sales and approximately $1.50 in net profits for each $100 of gross sales.

Over seven times the saving in the light bill, it would pay out the fluorescent investment in slightly more than one year. The customer has received a good bargain and the utility will gain revenue because this better lighting will be used more. More important than this the utility has gained the lasting goodwill of this customer if the utility has taken the leadership in this installation.

This brings us to the question of who is responsible for the bargain that the customer gets in fluorescent lighting. Surveys of initial fluorescent installations in the territory served by my company showed a connected load reduction of almost 50%, reduction of kwh. used 15%, practically no increase in the level of lighting and in many cases the quality of the lighting was definitely worse than it was before.

Our survey was from installations made in 1939. In 1940 we started an aggressive program of leadership towards higher levels and higher quality and better use of fluorescent lighting. This program was directed toward the education of the trade, education of consumers and leadership in sales effort.

The initial result doubled the prevailing level of fluorescent lighting and definitely increased the quality of lighting on installations where our representatives were called in. Since then the extremely poor installations have become the exception and many of our current installations are better than trebling existing lighting levels with 40, 50, 60 fc. or more of quality lighting. This leadership is definitely the responsibility of the utility. The bargain that the customer gets out of fluorescent lighting is the responsibility of the entire lighting industry.

Power Factor

Let's consider power factor a moment. If the customer gets a poor bargain in low power factor fluorescent, the utility has a serious problem. If the customer gets a good bargain and high power factor fluorescent, the utility does not have any problem.

Let's take a concrete example of a fluorescent installation comparing the two-lamp auxiliary having a 95% power factor with the single lamp auxiliary having a 50% power factor for the 40-watt tubes. What does the customer get for his money from this good power factor?

(1) He almost doubles the capacity of his wiring as far as lighting is concerned.

(2) He reduces the power lost in auxiliaries by 1/3rd.

(3) Reduces the power lost in the wiring by 60%.

(4) Reduces the voltage drop by 45%.

All of these advantages cost the customer only 25c for a 40-watt lamp in auxiliary equipment cost. These values to the customer are, of course, multiplied many times in terms of circuit capacity, power losses, voltage control of the utilities distribution and transmission system.

Without correction at the lamp the useless current of low power factor rides over and uses up the entire distribution and transmission system from water wheel to customer's premises. This is of greatly magnified importance today when every facility of the power system is utilized to serve the rapidly expanding war needs.

Control of power factor also rests with the leadership of the utility. Most utilities include a power factor provision in their rate schedules. However, experience today indicates that this provision should be backed up by a rate differential if 100% compliances are to be obtained. Even with regulations involving a surcharge for poor power factor, it is apparently essential to have an effective educational program on the value of good power factor. This leadership and education should be effective within the industry and to customers alike

War Production and War Economy

The revenue and power factor problems of the utility as such do not count now. All of our problems are of little moment if we do not win this war. Everything we consider must be first judged on the main premise of—what does it contribute or detract from our main objective to win this war? Yes, and we can win this war only with the maximum production now of the essential tools of warfare . . . machines . . . ships . . . tanks . . . planes . . . guns.

You ask what possible relation can there be between this war production and fluorescent lighting. Yet there is an important and direct relation between lighting and war production. The best utilization of lighting in our shops and factories can help win the war by . . .

In vast war production plants such as this aircraft factory, fluorescent has proved the only economical means of attaining the high intensities necessary. White cement floor reflects light for working under wing surfaces, etc. Photo Courtesy Austin Co.

1. Increasing production for war needs.

2. Conserving essential materials by reduction of errors in production.

3. Conservation of man power by reducing accidents and preserving workman's eyesight.

You have only to look to the actual results of peacetime light conditioning to see what it can do for our wartime effort. One machine shop reports that light conditioning resulted in a 50% reduction in accidents, 25% reduction in spoilage and 5% increased production per man-hour.

Another factory reports 15% saving in time to make settings and adjustments on machinery. One plant reports that machine repair time has been cut 20%.

An office reports typing on printed forms was speeded up 12%, billing machine production increased 7%, and shorthand transcription increased 20%.

These ordinary improvements in peacetime are increased materially under war conditions. Safety is more important than ever before. The national Safety Council states that production time lost through accidents to the American workers the first nine months of this year would have built 200 destroyers and 1,000 heavy bombers. Poor lighting is a direct and contributing cause of a large share of these lost-time accidents.

Conservation of man power is more important than ever before. For every man in uniform 10 men in war production are needed to supply him. This means that an army of 6 million will require 60 million war production workers. These workers must be mobilized from the inexperienced young and from the older men whose eyesight is already failing. They need much more lighting for their safety and for their maximum production.

War production is calling for seven days a week work and often 10- to 12-hour shifts per day. In these schedules fatigue takes an early toll on the worker's safety and on his production efficiency. Good lighting and visibility conditions materially reduce this fatigue and extend workers' efficient and safe productive limits.

Our war economy dictates that every improvement or investment of man hours and machines should be weighed in terms of war production results obtained. Let's weigh the cost of lighting equipment in terms of value of increased production on the basis of obtaining only a 10% production improvement with an increase of 4 times the lighting levels.

We find that fluorescent lighting investment will be returned 167% the first year on a one-shift operation and 500% on a three-shift operation. The investment on incandescent lighting for the same result would be returned 500% the first year on a one-shift operation and 1,500% on a three-shift operation. What other investment would bring back such immediate and substantial returns in increased war production?

Certainly the cost of building new plants and installing new machinery involves more delay and a slower return than mobilizing and light conditioning the immense existing productive capacities. Lighting . . . both fluorescent and incandescent . . . can play an important part in speeding up our war production and the lighting industry has a vital role to play in this phase of helping to win the war.

Aid "Scrap" Program

Publicity to the need for industrial salvage was given by Pacific Gas and Electric and Southern California Edison companies in unusual window displays arranged recently in connection with the nation-wide conservation program.

The PG and E display, showing the original scrap and its final war use, was used in its various district offices.

In a window of the Edison Building, California Edison directed attention to several industrial items not ordinarily regarded as salvage material. Confidential files ready for retirement were suggested as a good source of high quality rag paper for which the paper mills find many uses. The salvage movement is organized to provide bonded carriers who insure complete secrecy and safety of these files from the time a company releases them until they reach the mills.

Nichrome wire was described as another material which should enter war production channels instead of being thrown away. Its cash value has risen from nothing to 22¢ a pound.

Left, Pacific Gas and Electric Co. calls attention to the wartime uses of "scrap" metal. Below, Southern California Edison tells what can be done with old papers, rubber, rope and domestic appliances

Business Builder

Small specialties can help out now

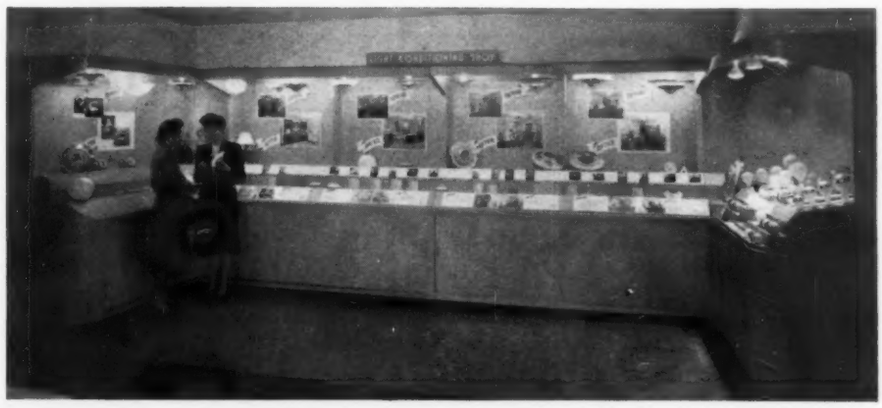
Often a little specialty, not big enough of itself to stir up business, can be used to build around. A number of dealers have done such business with a specialty item in connection with electric shavers within the past few weeks. The idea was especially welcome because of the shortages of regular appliance lines and the store traffic created by this promotion.

A shaver sharpening compound is made by Sunbeam for its own shaver. It is a minor item, selling for a quarter and lasting for an infinite time, so that selling it alone holds only minor potential. But around it was worked a promotion that brought in the satisfied previous shaver customers in a way that developed much good will and collateral business.

An ad was run for two days in most cases. While most of the ad was devoted to the new Shavemaster, a box offered users a free honing and sharpening of the head with this sharpening compound by a factory expert. It is important that the offer was not one of free repairs, but of sharpening. With the sharpening was given a cleaning, adjusting and oiling, for good measure, but the point was that the entire tone of the ad was positive, not negative.

Satisfied users did come in. They bought the sharpening compound and often the new model shaving head. Dealers had the rare experience of being thanked, of having people come to their stores who had never been in before. Typical of results was one case. The ad ran two days; 208 men came to the store, 162 had their shavers sharpened, 46 came to have a new shaver demonstrated; 48 bought the compound; 11 bought new heads; 7 bought new shavers of one model, two of another.

Similar results and with rather uniform percentages of results were had in promotions put on by Valley Electric Co., Pomona; Heilbron Electric, San Diego; H. L. Miller, Pasadena; Turners, Santa Ana; Bond's Jewelers, Glendale; Howards, Long Beach, and others.



Light conditioning center recently added by Hale Brothers in San Francisco, where correctly lighted rooms can be viewed and advisory service received. As a part of the new set-up, the store optometrist has been quartered in this lighting center

At a time when many appliance dealers were curtailing, Buford in Fresno, Calif. added a complete electric kitchen to his display room, with a home economist on duty to demonstrate cooking and lighting equipment. At the extreme right is the service department, which Buford has enlarged in keeping with his policy of giving a repair service that will make his customers' present appliances last. Specialists in refrigerators, laundry equipment and radio service are part of the staff.

● Vacuum Cleaner Service that is guaranteed by dealer, manufacturer and national magazine advertising has been put in effect by Premier Division, Electric Vacuum Cleaner Co., Inc. It will be made available through dealers selected to meet high service standards. The certified and guaranteed reconditioning service includes a complete checkup and report of necessary repairs, with advance quotations of exact charges to the consumer. Training of key service men will be conducted by the Premier factory branches.

● To "Keep 'Em Frying." Hotpoint has issued a booklet "How to Conserve With Hotpoint Electric Appliances." It is intended for use and guidance of owners of that company's refrigerators, ranges, water heaters, dish washers and home laundry appliances. On the theory that electric appliances properly used and properly cared for will last longer, Hotpoint is organizing a service program to that end.

● As a part of its campaign to enlist Americans in a move "to take good care of the things I have," McCall's magazine recently devoted space to the choice and care of kitchen utensils. In the same issue was a page pointing cleverly to the value of adequate wiring and suggesting that even at this time overloaded wires are dangerous and wasteful.

● "House of Magic" road show performances in Pacific Gas and Electric Co. territory totaled 84 in 34 separate towns with an aggregate attendance of 47,075. This traveling General Electric program was designed for presentation to grammar school, high school and to general public audiences. It has been making a tour of the West. Grateful expressions of appreciation for this educational program have been received from school authorities wherever shown.

Factory job of refinishing to make like new

Tied-in to Factory Service Program

Western service center established in San Francisco to supply parts and furnish major factory appliance repair

Sign or decalcomania label which dealers display

A STREAMLINED appliance service plan designed to improve service facilities to the consumer and to expand the dealer's profit opportunity, began operation June 1, after months of testing and planning. Western headquarters for the new service program is General Electric's new factory-operated appliance service center, at 351 Bryant St., in San Francisco, under the direction of H. M. Wade.

The new program was developed to help distributors and dealers "keep 'em working," but like many other developments inspired by wartime necessity, it will result in a permanently improved system of appliance service to the public.

G-E's new service plan was conceived as a wartime measure to improve the facilities for servicing the millions of the company's appliances in American homes, for these appliances *must* last for the duration.

The San Francisco appliance service center is one of three, and will serve the West. For several years it has operated as a factory for rebuilding household refrigerating machines. In the new program it will go "all-out" in service on practically all the household appliances. Service activities in California, Oregon, Washington, Idaho, Montana, Utah, Nevada, Arizona, Hawaii and portions of Wyoming and Colorado will be handled from here.

Dealers Will Participate

Dealers who are in a position to qualify will be signed up as authorized "appliance service centers" in their own communities. Each will act as local headquarters for all G-E appliance service. In this respect the plan will work in cooperation with the appliance distribution setup of dealers and distributors coming under the organization of Ben Tassie, Pacific Coast manager.

A complete course of instruction will be given to the dealer's personnel. Moving pictures, slide films and other training material has already been prepared. His store will be identified by a sign or decalcomania.

Service and repairs on appliances not handled by the dealer can be sublet to the nearest authorized dealer on that particular appliance, or the service center dealer may direct the customer to the proper place to obtain this service.

Some of the requirements which must be met by a dealer to qualify are: (1) maintain adequate trained personnel; (2) maintain an adequate stock of supply parts on all products which he services; (3) maintain a repair shop equipped to make minimum repairs; (4) maintain installation and service records; (5) maintain and keep up to date a complete file of General Electric service manuals, price lists and catalogues; (6) courteously receive and transmit to other authorized service center dealers all customer service calls which he is not equipped to handle; (7) adequately identify his store as a headquarters for General Electric service and promote service with advertising; (8) equip all his men with an adequate supply of tools.

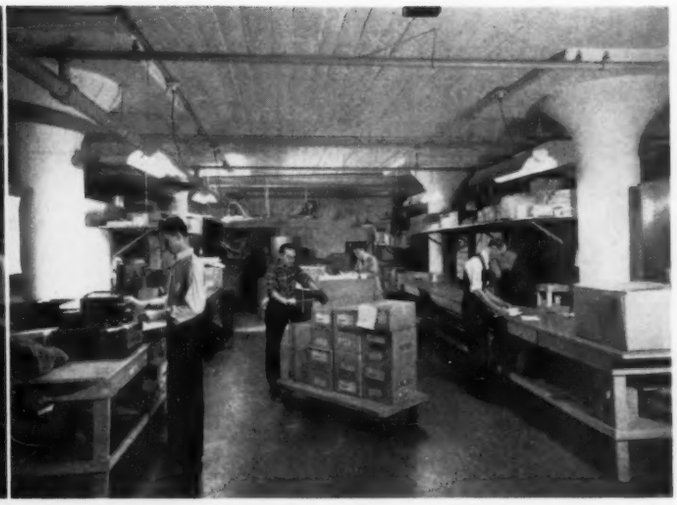
Conserves Parts Stocks

The new plan is not intended to interfere with any already well established and smoothly functioning distributor service facilities. Instead, it will supplement present activities.

Functions of the regional headquarters in San Francisco will vary with the particular problems in various areas in the west. Some distributors, particularly those in metropolitan areas, may call on the appliance service center only for parts. Other distributorships may encourage their appliance service center dealers to make use of the factory-

At right, ample stock can be centralized at the center to conserve critical materials. Below: the headquarters staff, W. J. Kern, H. M. Wade, C. C. Houston, F. H. Varney, J. R. Davis and A E Mulzer, men whom the dealers will work through

Small appliance repair department is equipped with special testing equipment



Shipping department arranged to expedite parts or appliances sent in for repair

operated service center in San Francisco not only for parts, but for service and repairs the dealer does not offer.

Distributors will not be required to have a large investment in parts. In many sections of the West there will be one and two day service on parts. Centralization of parts stock in San Francisco ties in with WPB's material conservation.

Primary purpose of the new service plan, according to H. M. Wade, western service supervisor for G-E, is to supply "restored service" to customers whose appliances fail during the war emergency. Following this principle it asks its service centers not to sell parts except when necessary for operation of the appliance.

How the Plan Works

Each appliance service center dealer carries a small stock of the more commonly used parts and is equipped to do ordinary repair work. When parts he does not carry are required, he orders these parts from the G-E service center in San Francisco, through his distributor, from where they are shipped the same day the order is received.

If repairs on an appliance are of major character and require heavy, expensive equipment, the dealer ships the appliance to the San Francisco service center, where complete equipment and factory service are rendered. In cases where repair work is required on appliances the dealer does not handle he can give the customer information, or he can sublet the service to a dealer who is equipped to handle it.

Folders and booklets for appliance users, giving common sense suggestions for keeping appliances in good working order have been prepared for use in connection with the program. In preparing this material home service editors of national magazines, advertising managers of several central stations and housewives themselves were consulted. This literature has been designed to eliminate unnecessary service calls through consumer education, and to encourage service calls in place of amateur tinkering. Service records show that a large proportion of all service calls are the result of lack of information about the product rather than an actual breakdown.

The San Francisco appliance service center headquarters for the western states devotes 40,000 square feet to repair shops, testing rooms and parts stock room. H. M. Wade directs the San Francisco regional office. Assisting him are A. E. Mulzer, shop superintendent; C. C. Houston, accounting manager; J. R. Davis, parts manager; R. Moore and M. Ross, shop foreman; W. J. Kern and F. H. Varney, field engineers.

Factory assembly line methods applied to complete rebuilding of refrigerator units

Air conditioned dust free room for assembly of the sealed-in mechanisms being rebuilt here

P G and E Repair Service

Cooperative program carried to electric dealers

With the truism "you can't stop the rain—but you can carry an umbrella," Pacific Gas and Electric Co. is carrying to dealers throughout northern California its program for coordinated repair service to existing appliances. Intended to coordinate with an advertising campaign during the months of June, July and August, the program has been worked out in cooperation with the manufacturers and wholesale supply houses of authorized repair service dealers. In this way qualified service stations will be designated and identified with the utility's copyrighted sign carrying the slogan "Duration-ize Your Appliances With Timely Repairs." Full details of the program will be reported in the next issue.

Public interest in the repair and maintenance of appliances has been discovered to be unusually keen as a consequence of the Red Cross classes on appliance maintenance in which company representatives cooperated in San Francisco. Originally scheduled for a series of three classes at two Red Cross community centers, one on Jackson Street, the other at St. Francis Wood, which began May 13, overflow attendance brought a demand for additional classes.

Women crowded the sessions, took notes, asked questions, and those who could not gain admittance remained 'til the sessions were over and begged for the lecture to be repeated.

First of the three classes was addressed by Cleo Filsinger, appliance counsellor. In it she told of the care of electric appliances. The second lecture was conducted by J. A. Hill, sales engineer, who told how to repair cords, replace fuses, make minor repairs and adjustments to the appliances. The final lecture was conducted by J. F. Aicher, also of the sales department, who talked on blackout suggestions and precautions, use of lighting and utility service during air raid alarms, blackouts, etc.

So much demanded was the Red Cross course that the American Women's Volunteer Services organization also planned classes on appliance use and repairs and requested speakers from the utility. In both cases courses were part of the official program: women signed up the same way as for First Aid training.

Pacific Gas and Electric Co. is offering advisory service on blackout problems. Above is a display of materials and methods in one of PG and E's division offices

● Scotching a Rumor that there would be no market this fall, the Western Furniture Exchange and Merchandise Mart of San Francisco announced its fall market for Aug. 3-8. Its theme, however, will be geared to "essential service" and although the radio and appliance displays have virtually been eliminated since the cessation of production, the customary Wednesday evening appliance trade dinner will be held Aug. 5.

What Of Trade Terms?

IES may mean Illuminating Engineering Society to you but it's a Latin abbreviation meaning "therefore" to one of the 400 representative middle-class housewives interviewed in the Ross Federal survey conducted for *Sales Management* and "International Espionage Society" to another.

Of the remaining 398, not one was able to identify the term correctly, although many of the women connected IES with electric service and one-quarter of them remembered seeing it in connection with ads about lighting. One woman remarked: "That's something I've always wanted to know but no one ever told me."

The terms AC and DC didn't fare much better. Only 35.5% of the women questioned understood the meaning of the abbreviation and one answered: "After Christ—that's all I know."

In the case of FM (which had the benefit of a lead in the mention of "radio" in the question) 24.5% made a correct identification but only 15.7 could offer a correct explanation of the meaning. Some thought it was "Federal something or other"; a few that it had to do with a food product; one that the "F" was for "foreign."

Trade terms in other industries met pretty much the same fate. Philip Salisbury, executive editor of *Sales Management*, places the blame for this lack of knowledge to the advertiser who assumes that terms and other abbreviations which are clear to him are equally clear to his prospects.

● "The Reference Handbook on Electric Home Appliances" designed as an aid to teachers of household management has been issued by Westinghouse Electric & Mfg. Co., merchandising division of Mansfield. In it are covered the electric kitchen, the refrigerator, range, roaster, dishwasher, laundry, water heater, iron, ironer, vacuum cleaner. In each case a short resume of the necessity for each of the appliances precedes helpful instructions for its care and use.

● "Utilizing Salesmen in Wartime," a symposium based on information obtained from sales executives of some 60 companies, representing a cross section of business and industry, has been published as a booklet by the G. M. Basford Co., advertising and marketing, of 68 42nd St., New York City.

● Idaho Power Co. is issuing two new publications—*The Dealer Bulletin and The Farm-O-Gram*. Published once a month or oftener, the bulletins are designed to help dealers make the adjustments demanded by the war program, and contain suggestions for business building.

● Its Timeplan Contract with the Bank of America has been cancelled for the duration, according to announcement by H. C. Rice, manager of domestic sales, Southern California Edison Co.

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Electrical West

Business Guide

For Electrical Dealers and Salesmen

Keep 'em Washing

Let's face the facts about this repair and service business. Is there really money to be made in it or will it be the old "used appliance" problem, only more so? How can you get rid of the old "grief" and "gripe" so often associated with it? If it can be made to pay, at least for the survival of the business, just how?

Certainly it can't be made to pay on petty $2 and $3 jobs. In fact the new regulations on delivery truck use, the tire restrictions, high labor costs, scarcity of parts, will call for something quite different from old methods of handling repair and service work if there is to be any hope in it at all.

Facing facts again, and looking into past practices, with a new and urgent need to know, let's admit that a lot of service work used to be pretty sketchy. It was carried on as a sort of necessary evil, to make minor adjustments to new appliances sold, relieve complaints, carry them over the guarantee period. When an appliance repeatedly gave grief, a new one could be sold. There were always the new gadgets on the latest model that the old one did not have.

A lot of the trouble came from doing a minor repair job here and there, just to make it work again. One thing was fixed, the customer charged $5 or $6. Then, shortly afterwards, something else went wrong. The customer came back mad. She had paid $6 to get it fixed, and she thought that it ought to be **fixed.** If it didn't work for some other reason, it was pretty hard to convince her. Yet she had only paid for a **patch-up job,** and received just that. Many dealers hate service work for the gripes and grief that just such methods develop.

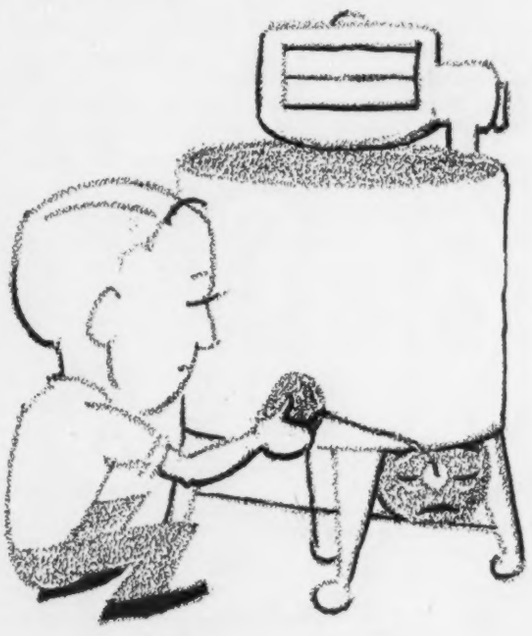
Obviously, that is **not** the way to handle repair and service work. In the first place many $3 to $6 service jobs will actually cost more than they bring in. There isn't enough volume to make it worth while trying. With service charges frozen along with retail prices, the way to survive is certainly not in penny-ante service business.

But there **is** volume business, and higher unit price business to be had, not in mere repairs, but in complete rebuilding and reconditioning. Such jobs may run close to the original cost of a new machine, but if they are well done, and **guaranteed,** will be worth it to the customer who cannot these days so easily get a new appliance.

In the washing machine and ironer business, to face the facts realistically, there is hope of survival in a program that includes these six points:

1. Appliances still on the floor and in stock.
2. Traded in washers—rebuilt for resale.
3. Rebuilding and guarantee of customers' appliances.
4. Honestly told patch jobs, sold only as such.
5. Contracted oil and check-up service on a periodic basis.
6. A selling plan to make the above pay and create enough volume.

Inside this Guide, suggestions to handle each of these to best advantage in today's crisis, are amplified.



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June, 1942

Business not washed up yet

True enough, because this is a mechanical war, materials that used to go into washers and ironers are needed to go into war munitions. The mechanical age into which the appliance salesmen have moved the housewife and the home, faces a retreat to old hard and primitive methods. It does if every effort is not made to keep the home machinery sold in the past working far into the future.

Yet, no matter how idealistic such a motive is, to keep a store open and a service department functioning, it takes profitable operation. Carrying on only one or two of the six points there may not be sufficient to weather the emergency; with all six there is a much better chance. And not the least, by any means, of the six is the last—**a selling program** to feed the other five.

1. **Appliances still in stock** constitute the first line of action, of course. But with frozen prices, higher down payments, shorter terms, selling has to change too. In order not to lose, the full ceiling price has to be obtained. Trade-ins have to be looked at from the standpoint of hastening a sale and thus building volume which would offset an allowance longer than the resale of the trade-in would warrant.

While the tightening of terms has proved good for the business in these times, it has also slowed sales. Sales cannot be made on gadget appeals, long trade-ins, low prices. They **can** be made on the old and fundamental benefits performed by home laundry equipment. You've heard them all before, but in case you've forgotten, here they are in "shorthand":

Clean clothes when needed, less clothes investment, children's clothes last longer, washed as needed, particular care can be given special garments, cost savings, relief from backbreak, time saved, no loss of treasured articles, work clothes can be given the right care, always ready for emergency washing during sickness or for company.

Ironers, too, offer: comfort while ironing, saving of lifting of a heavy iron, they save the feet, keep one cool while ironing, less starch is needed, press suits, save laundry costs, make for neat appearance and self respect. Moth larvae are killed by running woolens through heat. Curtains hang straighter.

2. **Traded-in—rebuilt for resale.** No longer will the traded-in washer or ironer be sacrificed to get it out of the way for new merchandise. If it is taken in at a figure low enough to permit its complete overhaul and rebuilding, for resale at a price under a possible ceiling (remember that refrigerators, second-hand and rebuilt, have been put under such a ceiling) such a washer or ironer can be sold with a guarantee, possibly on terms, and carry enough margin to make it as worth while as the sale of a new machine. If all the profit hasn't been given away on the trade, there is money to be made on guaranteed rebuilds.

3. **Rebuild for the customer.** Instead of just the usual patch-up job when something goes wrong, only to have something else go wrong again in a little while (for which the customer blames you), sell the complete guaranteed job. Instead of a $5 or $6 job, sell one for $30 to $40, with a guarantee.

One successful dealer found it advantageous to break down the overhaul job into parts, as the automobile shop does, with standard prices for each part. For instance, a price for the center post assembly rebuild, another for the wringer assembly rebuild, one for the power leg rebuild, and an overall quotation price for repainting.

Auto dealers have sold such jobs successfully for some years. Apply it to appliances now with success too.

4. **Patch-up jobs.** To eliminate the grief and gripe usually resulting from the ordinary patch-up jobs, in taking the order make it clear to the customer that it is just a patch-up job and only on the one item asked for. To make it doubly sure, it is a

very wise policy to have the customer sign the order and accept it as a patch-up job. Instead of kicking, many will bring it back asking for the complete overhaul job and admitting you were right. If you have made a sales presentation for the overhaul job first, and retreated to the patch-up only because the customer did not want to pay that much, you are in the clear and you have sold the eventual overhaul.

5. **Oil and check-up service.** Borrow another idea from the gasoline service stations—that of periodic oil and check-up service. One manufacturer, Easy, has developed a contract form which the dealer can sell for a three-year oil and check-up service call at six-month intervals, with a definite check chart of what oiling and checking is proposed to be done at each call, and at clearly stipulated prices. It is made plain to the customer that the service is not one of repairs, but of **prevention.**

Enough such contracts can be canvassed in each neighborhood to warrant covering by one person on foot. Expert mechanics are not required for this. Salesmen otherwise out of selling can learn the routine quickly, sell the contracts, follow up with the oiling calls. They can also discover much real repair business, sell the rebuild idea for the company's service department.

Best of all, what a prospect list they can develop for after-the-war sales to replace appliances.

6. **A selling plan** is just as necessary for this business as it is for the sale of new merchandise. Similar methods found successful for new merchandise, will build business in this peculiar emergency.

Every manufacturer of washers and ironers, or other appliances, is developing a service program. Your local utility probably has one too, with which you should identify yourself and your store to take advantage of its advertising that urges the repair of existing appliances.

Why not make up a visualizer, or presentation book for the salesmen. It works on new sales, it will help sell the rebuild job. Put in it "before" and "after" pictures of appliances repaired, testimonial letters, shop pictures, letters or certificates from factories naming you an authorized station, a sample guarantee certificate, outlines of sales points, budget term information, anything else that will help sell this service.

Also it is wise to do some newspaper advertising, and some direct mail to former customers. In other words make service a paying business instead of a pain in the neck. Your customers will appreciate it.

PUGET SOUND POWER & LIGHT CO.
PORTLAND GENERAL ELECTRIC CO.
CALIFORNIA OREGON POWER CO.
UTAH POWER & LIGHT CO.
IDAHO POWER CO.
ROCKY MOUNTAIN ELECTRICAL LEAGUE

Salesmen that Please

Sixth of a series of good sense articles on business management

By Ken Hampton

THE merchant's contact with customers is through people, sales people. It is true that the attitude of the employee toward the public reflects the attitude of the management. In fact, employees generally express that attitude quite accurately.

This is probably truer in a medium sized or larger organization than is generally believed. Yet in an organization where the employee and boss work side by side, the worker knows the boss and has a better chance to reflect his policies.

In larger organizations rules must be formulated and policies laid down. In spite of the utmost care with which these are made, they are subject to the ability of representatives of management to make work.

The priceless spirit of being made to feel important in one's job has often worked wonders with organization efficiency when all other means have failed. Everyone wants to believe that what he is doing is worth while; that it is important his task be accomplished. The man who can instill this feeling of importance in others produces wonders. He not only gets more work done, but he has happy workers, no labor problems and feels good inside himself.

Since pleasing people consists of doing more of the things people like and less of the things they don't like, let's see what people like about sales people.

Important in pleasing people is appearance. Window dressing is an important part of life. Just as a merchant dresses up his windows to make you desire to purchase his products, so you as a salesman should "dress up" yourself. Dress up your voice so that it is agreeable, your hair so that it is neat and your hands so that they are clean. Above all, learn to smile. Some points on which a customer judges are:

1. Does he look straight at me when he greets me? I want to be greeted as if I were somebody, not treated in an impersonal, offhand way.
2. Does his general appearance impress me favorably? I want to do business with an intelligent, responsible person.
3. Has he a pleasant voice? If he has, I'll spend more time talking with him.
4. Is he a good listener? I want to buy just the right thing and I don't want some salesmen trying to sell me something before he knows what I need.
5. Is he sincere? If he is earnest and serious, I'll believe what he tells me.
6. Is he self-confident? If he is, he must know his business. These salesmen who are nervous and ill at ease make me wary.
7. Does he give his whole attention to me and my problem? If he does, I'll like him, his store and the merchandise he sells. I guess if I'm going to spend my hard-earned money I deserve a little attention.

Whiling away the time with prospects isn't selling—it's visiting, and if done at all, should be done after the purchase has been completed. No salesman was ever injured or lost his life as a result of asking a customer for an order. The customer should receive a friendly greeting, be given a chance to express his need, asked to buy.

Organization merchandising efficiency is directly dependent upon sales training. Usually this is done best by inspiring employees to improve themselves and develop their own abilities to sell by pleasing.

Here is a check list for salesmen:

1. Are you selfish? Selfish people are not well liked. This will show up in
   a. Are you more anxious about the reward for the job than in getting the customer served and your work well done?
   b. Are you stingy? This means you are willing to take without giving in return. A salesman serves best by forgetting himself and giving time and attention enthusiastically to his customers.
2. Are you self-centered? If you are, people don't like to trade with you. This will show up in
   a. Lack of interest in the other fellow.
   b. Intolerance of other's opinions. A salesman never contradicts people.
   c. Being overcritical of people. A successful salesman likes all people.
   d. Overlooking the good in people and seeing only their faults.
3. What kind of a mixer with other people and in crowds are you?
   a. Poor? If you are, learn to smile and be more friendly.
   b. Are you too much of a good fellow regardless of consequences? If you are, you are probably entertaining yourself and becoming a nuisance.
4. Are you reliable? Customers want to trade with responsible people.
   a. Do you often pass the blame for mistakes on to other people.
   b. Do you stand on your convictions quietly but solidly, or are you a moral coward?
   c. Are you mentally insincere? Do you try to just get by?
5. Are you a worrier? A worrier does not express confidence.
   a. Are you easily discouraged?
   b. Are you given to self-pity?
   c. Do you worry about what would happen IF?
6. Do you have a definite, worthwhile purpose and are you doing your best to attain it? If you are, you will be successful, and customers like to trade with successful people.
7. Have you a definite faith in your own ability and the worthwhileness of life? If you have, you will win confidence.
8. Are you loyal to your employer? Loyalty helps inspire confidence in others.
9. Do you encourage others and express generous impulses? If you do, people will like you.
10. Can you and do you control your temper? You had better because it is essential that you be pleasant in order to please others.
11. Are you a builder instead of one who tears down? The rewards go to builders and those who tear down only undo what others have built.

It takes faith, vision and courage to build a successful merchandising business. The business must operate around and through people who serve other people. The business can only grow and prosper by pleasing customers well enough so that they will return again and again to purchase the products the store sells. Even the Supreme Court recognizes this because it defines good will as "The disposition of a customer to return to a place where he is well served".

COMMITTEE REPORTS

Northwest Electric Light and Power Association
1941-42

Table of Contents

Business Development Section

It Is Utilization Section Now 80
by D. J. McGonigle, The Montana Power Co.

Engineering and Operation Section

Engineers Study Wartime Operation 81
Review of the 19th Annual General Meeting of the Engineering & Operation Section at Seattle

Accident Prevention Committee

Accident Prevention Pays Dividends 82
by B. F. Lentz, Eastern Oregon Light & Power Co.

Utilization Committee
Illumination Sub-Committee

Use of Street Lighting Evaluator 83
by C. T. Bakeman, Puget Sound Power & Light Co.

Power Production Committee

Maintenance Plans for Power Units 85
by John Stobie, The Washington Water Power Co.
Discussion 88

Inspection Programs for Steam Plants 88
By John MacEwell, Puget Sound Power & Light Co.
Discussion 89

Electrical Equipment Committee
Systems Engineering Sub-Committee

Northwest Utility Coordination 90
by L. B. Cowgill

Meters and Services Sub-Committee

Field Testing of Socket Meters 90
by L. E. Wiggans, Eastern Oregon Light & Power

Operation and Maintenance Sub-Committee

Maintenance Plans for Emergencies 91
by W. C. Sanders, The Wash. Water Power Co.
Discussion 95

Apparatus and Design Sub-Committee

Automatic Circuit Breaker Reclosing 95
by A. C. Schwager, Pacific Electric Mfg. Corp.
Discussion 98

Transmission and Distribution Committee

N.E.S.C. Crossing Requirements 98
by William L. Cone and Cassius C. Gaddis, Utah Power & Light Co.
Discussion 98
(written) by Earl Baughn
(written) by R. S. Daniels

Coordinated Fusing Plus Spill Gaps Give Continuity 99
by C. N. Teed and J. F. Servis, Idaho Power Co.
Discussion 99
(written) by R. S. Daniels

Shunt and Series Capacitor Use 100
by Waldo E. Enns, Portland General Electric Co.
Discussion 103
(written) by R. S. Daniels

Steel vs. Copper for Conductors 103
An informal discussion

Code Committee

War Enforcement of the N. E. C. 104
by S. B. Clark, Northwestern Electric Co.
Discussion 104

Wartime Operation
A Symposium

Plant Protection in California 104
Summary of extemporaneous remarks by A. W. Copley, Westinghouse Electric & Mfg. Co.

What the Industry Is Doing to Help 105
Summary of extemporaneous remarks by A. B. Campbell, Edison Electric Institute

Salvage Vital to War Effort 105
by George Sutherland, Industrial Salvage Section, WPB
Discussion 107

Business Development Section*

It Is Utilization Section Now

By D. J. McGONIGLE
The Montana Power Co.

THE Business Development Section commenced its year's work with a meeting of its Advisory Executive Council in Seattle Sept. 29, 1941. At this time the section organization was completed and plans were laid for the annual meeting. In connection with this annual meeting, the section accepted the invitation of the Western Division of the Canadian Electrical Assn. to meet jointly with that group in Vancouver, B. C., in March.

At the executive council meeting in Seattle, it was decided not to hold a fall commercial sales conference, but to look into the possibilities of holding a lighting sales conference in the spring at about the time of the then proposed IES lighting conference, tentatively scheduled to be held in Seattle in April, 1942. This meeting was not held.

The commercial and industrial heating data sheet program of the section was carried over into the year 1942, since only a small number of data sheets had been produced in 1941. Subscribers to the 1941 series of data sheets were advised that the program would be continued until the obligation of the association to supply 24 data sheets in this series had been fulfilled, or until it might be found necessary to discontinue the program, in which case a pro rata rebate would be made to subscribers. As of the date of this report, May 1942, the program is still in progress. Nine data sheets have been issued in the 1941-42 series and the tenth is in process of production.

After the declaration of war in December 1941, the question arose as to whether or not it would be feasible to hold the proposed joint meeting in Vancouver, B. C., in March. A canvass of the member companies of the association and a conference between our B. C. members and the Canadian Electrical Assn. resulted in a decision to go forward with these plans as originally intended. Consequently a group of bureau chairmen and other members of the section met with W. C. Mainwaring of the B. C. Electric Railway Co., in Seattle Feb. 2, and in Vancouver, Feb. 3, where plans for the program and other arrangements were put in motion.

This meeting, the seventeenth annual for this section, was held in the Hotel Vancouver, Mar. 4, 5, and 6, 1942, with Tom Ingledow, B. C. Electric Railway Co., as general chairman. It was attended by 70 delegates from the five Northwest states and 181 Canadian delegates from both eastern and western Canada.

The meeting opened the morning of Wednesday, Mar. 4, with a general session under the chairmanship of E. H. Adams, B. C. Electric Railway Co. An address of welcome was heard from W. G. Murrin, president of the B. C. company, and a response by McNeely DuBose, president of the Canadian Electrical Assn. Chief address of the session was delivered by Hon. R. L. Maitland, K. C., attorney-general of the Province of British Columbia, to which D. B. Leonard, Pacific Power & Light Co., and vice-president for Washington of the Northwest Electric Light & Power Assn., responded.

Wednesday afternoon and Thursday morning, Mar. 5, and Friday morning, Mar. 6, were devoted to concurrent bureau meetings. In our Business Development Section the Residential Bureau met under the chairmanship of C. E. Hess, Puget Sound Power & Light Co.; Commercial & Industrial Bureau, under Ladner V. Ross, The Washington Water Power Co., chairman; Rural Bureau, under J. C. Scott, Puget Sound Power & Light Co., chairman pro tem.; and the Advertising Bureau under M. G. Kennedy, Pacific Power & Light Co., chairman. At the same time, the Engineering & Operating group of the Canadian Electrical Assn., held a conference which was attended by some of the engineers and superintendents from the Northwest association territory in the United States. These sessions were chairmanned by A. Vilstrup, B. C. Electric Railway Co.; C. R. Reid, The Shawinigan Water & Power Co.; and Art Abbott of the same company. The programs of all these conferences were built around the new wartime problems now facing the several fields of electric utility operation. Likewise the programs at the general sessions centered around the utility company's relationship to the war effort.

The general session Thursday afternoon, Mar. 5, was chairmanned by T. Ingledow, B. C. Electric Railway Co., and was addressed by Henry R. Kruse and C. T. Bakeman of Puget Sound Power & Light Co.; E. W. Arnott, B. C. Electric Railway Co.; and George C. Tenney, president of the Pacific Coast Electrical Assn.

The meeting closed Friday afternoon with a general session at which D. J. McGonigle, The Montana Power Co., and chairman of the Business Development Section, Northwest Assn., presided. At this session the following presented papers or delivered talks and addresses: A. Vilstrup, B. C. Electric Railway Co.; M. G. Kennedy, Pacific Power & Light Co., chairman of the Advertising Bureau; Carl Eastman, N. W. Ayer & Sons, San Francisco; Fred W. Holz, Reddy Kilowatt, New York; B. C. Fairchild, secretary of the Canadian Electrical Assn.; Ed. Vennard, vice-president, Middle West Service Co., Chicago; and J. E. E. Royer, vice-president, The Washington Water Power Co.

Several pleasing entertainment features were interspersed throughout the three-day meeting for the benefit of the visiting delegates, including a dinner, a luncheon and a cabaret. Under the gracious influence of the Canadian contingent, T. C. Clarke, Northern Electric Co., T. H. Crosby, Canadian Westinghouse Co., and W. Douglas Robertson, Canadian General Electric Co., the "Dog House" became "Mac and Sam's Glow Room."

At a meeting of the Advisory Executive Council, held in the Vancouver Hotel, Mar. 6, 1942, the council recommended that the name of the section be changed to Utilization Section.

The proceedings of the Vancouver meeting are being prepared in mimeographed form for distribution to member utility companies of both associations.

*Advisory Executive Committee: D. J. McGonigle, The Montana Power Co., Chairman. Henry R. Kruse, Puget Sound Power & Light Co., Vice-chairman. B. C. Electric Railway Co., W. C. Mainwaring; The California Oregon Power Co., Glenn L. Jackson; Eastern Oregon Light and Power Co., LeRoy A. Grettum; Idaho Power Co., Ralph E. Gale; Mountain States Power Co., Harold E. Farris; Northwestern Electric Co., J. C. Plankinton; Pacific Power & Light Co., M. G. Kennedy, D. B. Leonard; Portland General Electric Co., A. C. McMicken; Puget Sound Power & Light Co., C. E. Hess, C. Patrick Johnson; Utah Power & Light Co., K. W. Browning, W. A. Huckins; The Washington Water Power Co., R. B. McElroy, Ladner V. Ross; West Coast Power Co., C. A. Comstock; Edison General Electric Appliance Co., J. C. Platt; Hurley Machine Co., R. G. Chamberlain.

Engineering and Operation Section*

Engineers Study Wartime Operation

THE 19TH ANNUAL general meeting of the Engineering & Operation Section convened at the Olympic Hotel, Seattle, Apr. 23 and 24, 1942, under the chairmanship of Magnus T. Crawford, Puget Sound Power & Light Co. J. Hellenthal of that company acted as chairman of the committee on arrangements. Registered attendance was 139 with 84 from outside Seattle and 55 local. This year the meeting was streamlined to two days instead of three, and emphasis was placed on more general discussion, time for which was provided by having the papers briefed in presentation. In addition, one afternoon session was devoted largely to round-table discussion of various new problems created by the war.

Most of the formal papers are printed in the following pages, but four may be found in other issues of ELECTRICAL WEST as follows:

Coordinated Fusing Plus Spillgaps Gives Service Continuity, by C. N. Teed and J. F. Servis, Idaho Power Co., appeared in the March issue. Discussions of this paper are included herein.

Northwest Utility Operating Coordination, by L. B. Cowgill appeared in the April issue.

Two papers are in the May issue: (1) *Crossing Requirements of the Safety Code*, a comparison of the 4th and 5th editions, by William L. Cone and Cassius C. Gaddis, Utah Power & Light Co.; and (2) *Wartime Enforcement of the N. E. Code*, by S. B. Clark, Northwestern Electric Co. Discussions of these two papers appear herein.

A summary of the meeting follows, with particular reference to material presented therein, which, for one reason or another, is not published.

The meeting opened Thursday morning with a word of welcome from Charles F. Terrell, operating manager, Puget Sound Power & Light Co. Immediately thereafter, Eldon E. Beck, Idaho Power Co., chairman of the Accident Prevention Committee, presented the program of his committee, in the course of which he commented on the responsibility of utility safety men toward the general safety work in their communities. This subject was further emphasized in a paper by C. C. Haggard, The California Oregon Power Co., entitled *Should a Public Utility Safety Director Engage in Public Safety Work*, which reached the conclusion that he should. These two papers are not published, nor is the report of lost-time accidents of the member companies, a tabulation of which was distributed in mimeographed form. A paper on accident prevention methods of Eastern Oregon Light & Power Co., by B. F. Lentz, is published hereinafter.

The balance of the morning session was given over to the Utilization Committee under John Bankus, Portland General Electric Co., chairman. First sub-committee to be introduced was the Utilization Devices Sub-Committee, of which J. E. Yates, formerly Pacific Power & Light Co., and now with the WPB, was chairman. Under this committee head, L. R. Elder, General Electric Co., told of studies made on the system of Portland General Electric Co. to learn how and with what equipment the company's system could be blanketed with 720-cycle carrier current for control of street lighting and other load, having reference to the possibility of using such control for blackout purposes. Mr. Elder's discussion, which was not presented in written form for publication, came to the conclusion that it was feasible to blanket the entire system with one transmitter located at the Knott Street substation, and that with a relatively smaller capacity, various parts of the system could be covered.

The Illumination Sub-Committee program was conducted by Paul L. Marble, Puget Sound Power & Light Co., who presented a brief discussion of the principle underlying protective lighting at plants and stations. This paper is not published, nor is another brief paper by L. C. Smith, Puget Sound Power & Light Co., on *Lighting for Production in War Industries*. An analysis of the use and purposes of the street lighting evaluator by C. T. Bakeman, Puget Sound Power & Light Co., is published hereinafter.

The first part of the afternoon, E. H. Collins, The Washington Water Power Co., chairman of the Power Production Committee, presented two papers, one pertaining to maintenance of hydro plants and the other to steam plants, both of which appear herein with the discussions on them. The first of these is by John Stobie, The Washington Water Power Co., and the second, by John MacEwell, Puget Sound Power & Light Co.

The Electrical Equipment Committee took over under the chairmanship of J. Hellenthal, Puget Sound Power & Light Co., in the middle of the afternoon, and the meeting first heard L. B. Cowgill's story on *The Coordinated Operation of Power Systems in the Pacific Northwest*, referred to above. This was the presentation of the Systems Engineering Sub-committee, of which O. L. LeFever, Northwestern Electric Co. is chairman.

The Meters and Service Sub-Committee, led by C. S. Alger, Puget Sound Power & Light Co., offered two papers, one on problems of combined 3-phase and single-phase metering by E. W. Williams of The Montana Power Co., which is not published; and one on field testing of socket-type meters by L. E. Wiggans, Eastern Oregon Light & Power Co., which is published.

That evening the Executive Committee held its annual dinner and at the same time there were two special meetings: one for the meters and services group and the other for the accident prevention group.

On Friday morning the Electrical Equipment Committee completed its program with a presentation of one paper under the Operation & Maintenance Sub-Committee, which is chairmanned by C. D. Raney. The Washington Water Power Co., and one under the Apparatus & Design Sub-Committee, J. C. Henkle, Portland General Electric Co., chairman. These papers, both published, are by W. C. Sander, The Washington Water Power Co., and A. C. Schwager, Pacific Electric Manufacturing Co., respectively.

The balance of the morning was given over to the presentation of the Trans-

*Executive Committee: M. T. Crawford, Puget Sound Power & Light Co., Chairman. Harry M. Jones, Idaho Power Co., Vice-chairman. B. C. Electric Railway Co., A. Vilstrup; The California Oregon Power Co., J. C. Boyle; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., E. E. Beck; Northwestern Electric Co., S. B. Clark, O. L. LeFever; Pacific Power & Light Co., R. J. Davidson, H. H. Schoolfield; Portland General Electric Co., John Bankus, C. P. Osborne; Puget Sound Power & Light Co., J. Hellenthal, George E. Quinan; Telluride Power Co., Paul P. Ashworth; Utah Power & Light Co., L. B. Fuller; The Washington Water Power Co., E. H. Collins, J. B. Fisken, L. R. Gamble; West Coast Power Co., Henry Berk.

mission and Distribution Committee program, R. J. Davidson, chairman. The program opened with the presentation of the Cone and Gaddis paper on the N.E.S.C., presented by A. C. Kelm, Utah Power & Light Co., which has been referred to above. J. F. Emery, Idaho Power Co., then presented the paper by Teed and Servis on Coordinated Fusing, also referred to as having been published elsewhere. Discussions on these papers are included herein. A report by W. E. Enns, Portland General Electric Co., on experience with shunt and series capacitors, with the discussion on it, is published hereinafter. Reports on repairing and reconditioning distribution transformers by B. H. Aaron, Northwestern Electric Co., and on barewire leads to transformers by Walter Smith, Mountain States Power Co., were distributed at the meeting and are not published.

On Friday afternoon occurred the symposium on and discussion of utility problems under war conditions, with Magnus T. Crawford, section chairman, presiding. A. W. Copley, Westinghouse E. & M. Company, San Francisco, lead off with a resume of protective measures and emergency operation of electric utilities in California, and a summary of his remarks, which were delivered extemporaneously, is published herein. A. B. Campbell, engineering department, EEI, told, extemporaneously some of the national aspects of wartime operation, and a summary of his remarks is likewise published.

At this point, S. B. Clark, Northwestern Electric Co., chairman of the Code Committee, presented his paper on wartime enforcement of the N.E.C., which has been referred to above. George Sutherland, utility coordinator, Industrial Salvage Section, Bureau of Industrial Conservation, WPB, then discussed the *WPB Salvage and Scrap Speed-up Program*, which is published herein. Berkeley Snow, executive secretary, Northwest Electric Light & Power Assn., told of the wartime mutual assistance program started early this year by Northwest companies, a complete outline of which can be seen in the April issue of ELECTRICAL WEST.

The meeting closed with a general discussion of some of the points raised in the foregoing presentation. Mimeographed copies of practically all the papers referred to are available in the office of the secretary for distribution to interested persons.

The annual dinner of the section was held in the Olympic Hotel, Friday evening with Charles H. Cutter, Pacific Electric Manufacturing Co., as master of ceremonies, and Joseph Thompson, president of that company, San Francisco, toastmaster.

On Saturday, Puget Sound Power & Light Co. conducted a number of delegates to the new salvage shop of the company at Everett, Wash.

Accident Prevention Committee*

Accident Prevention Pays Dividends

By B. F. LENTZ
Eastern Oregon Light & Power Co.

I DO NOT LIKE the hackneyed expression "safety conscious", but it is necessary to carry individual employee training to a point where safe working habits do not require a conscious effort but become natural habits, carried out by the *subconscious* mind. A word of caution is not out of line at this point. Any such program must start with an organization of utility employees whose interests and personalities are as varied as the books in a public library. This makes it necessary to proceed with caution with any program affecting older employees so that no active antagonism is built up.

As briefly and concretely as possible, the program of the Eastern Oregon Light & Power Co. follows:

Physical Examination Required

After an applicant has been selected for any job he is required to undergo a doctor's examination. The examining physician is informed of the job requirements, and is expected to detect disability which would prevent the applicant from performing the duties expected of him. After the new employee has been put on a job which is not beyond his physical capabilities, he is continually watched and cautioned by his foremen, supervisor, and fellow workmen. As he becomes somewhat familiar with his duties, he is presented with a book of company safety rules, which are very general in scope, but serve to impress on him that he is really expected to do the job safely or leave it alone.

Division Safety Meetings

Once each month a meeting is held in both Baker and La Grande, to which all employees are invited. The meetings are held on company time, and an effort is made to secure representation from every department. Our company is small enough so that everyone can be included who wishes to attend, and by this method practically everyone attends a meeting at least now and then. Only two officers are elected from the employees once a year. These consist of a chairman who presides at the meetings, and a secretary who records the minutes.

The program at these meetings is likely to become the same old story. In order to conform with the State Industrial Accident Commission requirements, an analysis of the accidents which have occurred must be made. We include every accident which has been serious enough to require a doctor's services. As the employee who had the accident is usually present, this is a good chance to get at the real cause of the accident. I frequently have to caution those present that the real object is not to pass the blame to any employee or his foremen or fellow workers, but to find out how such a thing can be prevented in the future.

This is the most important point in any prevention plan. I usually try to guide the discussion myself so that no ill feelings are aroused.

There are times when there are no accidents to discuss in a company of our size. We then read some of the reports published by the National Safety Council or other member companies of this group, and the discussion of these really gets the men to thinking.

We try to vary our programs a little by such things as artificial respiration practice, or an occasional sound-slide film on safety subjects. As a rule the time is too short, as we try to hold them to one hour.

Accident Reports

We have always insisted upon an immediate report of all accidents.

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These are usually brought to my attention or someone else with authority who will insist upon a visit to the doctor if it appears at all necessary. In this connection I find that an employee is much more cooperative if he is allowed to select his own doctor.

In case of a minor injury I ask that a small card size form be filled out and sent to me. I then proceed to tuck them away where they are not seen, to prevent any "joshing" or criticising, which might cause the worker to conceal an injury the next time.

Accident Insurance

The company has in effect a group insurance policy by which illness and off-the-job accidents are fairly well covered. This is very useful in two ways. When the Accident Commission sees that such protection is in effect they are never very critical of claims which might otherwise be questioned as off-the-job accidents. Also, I really believe that it has prevented both the commission and the company from being the victims of such claims.

Another point along this line is the prevention of both real and fraudulent claims by a temporary employee who knows his job will be over in the next day or so. Very close supervision is needed at any such time to see that no real injury occurs, or that none is trumped-up by the employee. Such injuries are not likely to be serious but can ruin a record.

First Aid Training

First aid training is invaluable to our company. I say this with full realization that it is likely to be the most expensive part of the entire program, both in equipment and in time consumed.

Our company has gone into regular Red Cross first aid training with the idea in mind to have everyone take at least a standard course before working very long. We are not always able to achieve this, but are usually fairly successful. This training really brings home the direct effect of an accident. I prefer to have such employees in classes conducted by their own fellow workmen, as they have a better understanding of the problems they are most interested in.

Out of less than 100 employees, we have 44 with advanced Red Cross cards, and nine now hold instructors' cards, with many of the others having had instruction even though not holding up-to-date cards. One of the first thoughts on any job, large or small, is safety.

The most effective method of preventing accidents in the Eastern Oregon Light & Power Co. has always been to keep bringing home to the worker the thought that the employee himself is expected to use his own brain to prevent accidents, but that the company will do its best to provide proper equipment and working conditions if the worker will only suggest what is needed.

Utilization Committee*—Illumination†

Use of Street Lighting Evaluator

By C. T. BAKEMAN
Puget Sound Power & Light Co.

STREET-LIGHTING engineering in the past was a matter of designing wires, poles, crossarms, brackets, etc., to a utility distribution system. Very little consideration was given to the essential needs and purposes of street lighting and the design that would best serve these needs and purposes. The purpose of street lighting is to adequately light the streets for safety of the public, for the safety of property, facilitation of night traffic, and with modern high speed traffic conditions this is primarily a matter of visibility on the streets at night.

Street Lighting Today

The street lighting engineering of today and in the future is a matter of designing a lighting system to provide certain seeing and safety results on a street and adapting the use of wires, poles and fixtures to most economically and effectively serve this purpose.

War Safety Needs

There has been a trend of thought that curtailment of gasoline consumption and the rationing of cars and tires would reduce traffic to the point that our critical traffic safety problem would be greatly relieved. Safety and traffic engineers do not share this view nor do current records prove it out particularly in war production areas. The urgent need for increased war production requires an increased flow of traffic, involves increased traffic hazards and places a higher premium on safety to the critical manpower of this country. Recent traffic surveys in Seattle have shown an increase in traffic rather than a decrease and have shown a much more decided "peaking" up of the traffic and creation of new traffic "peaks," some of which are occurring during the dark hours. Twenty-four hour operation of war industries involves new traffic flows during the dark hours. Plans are under way for the opening of stores between noon and 8:00 p.m. which would involve an additional dark hour traffic flow. All of these things add to the importance of street lighting as a critical safety need.

The street lighting evaluator provides a scientific measurement of visibility on streets as a basis for: (1) Engineered design of street lighting units. (2) Proper selection of street lighting units for various roadways. (3) Proper layout of street lighting units on a given roadway. The evaluator permits accurate engineering for these things for the best seeing results with the most economical installation cost and the most economical operating cost.

It also permits measurement of seeing ability under a street lighting system along the roadway, on each lane, and at each point. Summary results show the average and minimum seeing values. It shows comparison of the effectiveness and efficiency of one system with another. It provides for the engineering of a street lighting plan for a given seeing ability. It measures improvements in the design of street lighting fixtures and in the layout of street lighting systems. It permits writing specifications of a street lighting system calling for given seeing results. It makes tests on the scene of accidents to determine the exact visibility conditions. It can be used for tests and im-

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provements in road bed characteristics to improve visibility.

Measurements Essential

The science of engineering is almost wholly dependent upon the accuracy of measurements available. In previous street lighting engineering, we used such terms as candlepower, footcandles, and pavement brightness and footlamberts. These are factors in the ultimate purpose of the street lighting system, that is, safe visibility. They do not offer a direct evaluation of this visibility and to arrive at a net visibility, determination from these measurements involves a complicated and inaccurate formula. Street lighting engineering has been handicapped and held back by the lack of accurate means of measuring the net result of this system in terms of visibility. The street lighting evaluator puts together various factors which determine visibility and permits a direct measurement of the net effectiveness of any street lighting system.

How Does the Evaluator Measure?

The street lighting evaluator measures seeing results by measuring the three major factors in traffic seeing. As we drive along at night we see mostly by silhouette, being able to pick out pedestrians or other obstacles by the dark silhouette against the relatively bright pavement. This seeing ability is directly proportional to the pavement brightness. A secondary factor in our seeing ability is the recognition of an obstacle by the light reflected from it. We might call this direct seeing or direct recognition. This seeing is proportional to the amount of light reflected from the obstacle or its brightness. The third factor is a negative one. The glare from the street lighting system itself reduces our ability to see. This is called veiling glare, quite appropriately, since its effect is similar to drawing a veil in front of the eyes. This veiling glare depends on the brightness of the source, its position and direction into the eyes and many other factors which are summed up by the street lighting evaluator.

One of the interesting features of the instrument is that it carries its own sample roadway and miniature pedestrian which is in front of the platform mounted on the car hood. The evaluator carries some 24 different road surface samples which can be matched up with the street surface being tested. The miniature pedestrian or obstacle is visually scaled to the size of a person viewed from 200 ft. back of the car, with a reflection factor on the viewed side equal to the average winter, night-time clothing of pedestrians. The tunnel on the back of this platform has a variable photometric field connected to a control box within the car. When the photometric field is viewed from the driver's position, the observer can accurately measure the brightness of the pedestrian and the pavement each in turn, giving a positive measurement of these for each position on the roadway.

The glare integrator mounted above the windshield has an opening shaped and optically scaled to represent the average windshield. The lower portion of this is blocked off to eliminate interference from passing headlights. This device actually produces a veil of brightness proportional to the glare effect of the street lamps to the driver. The observer looking in the observing slot measures the glare by photometric balance with the control box. The reason for mounting the pavement slab on the engine hood is to elevate it away from interference of passing headlights.

The procedure of testing the brightness of the pavement, obstacle pedestrian, and glare is relatively simple, taking about one or two minutes each for a complete test. The photometric fields in each case are variably illuminated words — PAVEMENT, OBSTACLE AND GLARE, respectively. With the control box connected to each word in turn, its brightness is reduced to the point where it matches the brightness of the background at which time the word disappears. A push button then punches the card at the relative scale position of the brightness measured. Although simple, some practice is needed for accurate measurements. While headlights do not interfere with the instrument, they do interfere with the observer's eyes and freedom from this interference is desirable.

A measurement is made of pavement brightness, obstacle or pedestrian brightness and veiling glare at each test station. Brightness of the pavement and brightness of the pedestrian are arbitrarily weighted on a 70-30 basis to obtain what is called a weighted field brightness. This combination, 70-30, is based on the observation that 70% of our seeing is by silhouette seeing and 30% by direct object seeing. The weighted field brightness then gives us a seeing ability or relative visibility independent of any glare interference. By converting the veiling glare measurement to percentage reduction of ability to see, the net relative visibility or seeing ability is obtained.

Seeing results on any lighted street are a combination of the street lighting system and a pavement surface itself. The character and reflection of the latter has a dominating influence since 70% of our seeing is accomplished by silhouette and depends on pavement brightness. For instance, two equally good street lighting systems would not be equally effective, one on a black top surface, and the other on light, new concrete surface. The darker the street surface, the less effective the lighting system, or the more light needed for safe seeing.

New Facts Disclosed

The writer has had the privilege of using the street lighting evaluator on measurements of street lighting in various locations in the Northwest. These measurements have disclosed certain new facts and factors that were not evident or available before. Here are some of them:

An installation of 10,000-lumen sodium vapor units oppositely-spaced 185 ft. centers, tested the highest visibility rating of any installation in the Northwest. This lighting installation was designed to be adequate for the ultimate traffic capacity of the roadway even though the initially anticipated traffic flow was considerably under the ultimate capacity. The street lighting, in other words, was designed for the capacity of the roadway. Contrast this with most of our traffic arteries where purely residential standards of lighting are installed and where initial heavy traffic has been increased greatly. A notable example of this is on Aurora Avenue in Seattle.

Although the Lake Washington Bridge installation had the highest visibility rating, tests proved that it was not the most efficient installation for a given visibility result either as to installation cost or operating costs. For example, one section of the lighting on Interstate Avenue in Portland provides nearly as much average visibility as the Lake Washington Bridge installation with two-thirds the lamp wattage per foot of roadway. This is in spite of the fact that the sodium luminaire is almost twice as efficient in light generation as the incandescent used on the Portland installation.

Tests show that the efficiency value of the sodium luminaire is largely lost due to less efficient confinement of the light to the roadway by reflectors. Tests would indicate that the sodium luminaire would be best applied to wide roadways, to areas where scattered light on each side of the roadway is of value, where the orange color is of precautionary value in danger zones and where relatively close spacing of the units may be made.

The tests quite definitely indicated that mounting heights of 28 to 30 ft. are desirable as contrasted with the usual 20 or 25-ft. mounting height previously considered satisfactory.

Tests indicated that to obtain uni-

form visibility along the roadway, it would be necessary to reduce the ratio of spacings to mounting height.

The test brought out forcibly the fact that glare control is an important factor in efficiently obtaining visibility along the street. This involves higher mounting heights and approved factor design to cut off the light source from view angles in sofar as it is possible.

Many of our installations previously thought satisfactory when tested, showed rather spotty visibility along the length of the lighting span. Ratios of evaluation as high as three to one between the average evaluation and the minimum evaluation along the roadway were found.

There is little doubt that the development of this street lighting evaluator and the research back of it is one of the greatest contributions to street lighting engineering and to traffic safety developments of this age. Recognition is hereby given to Kirk Reid and H. J. Chanon for this contribution to the art of safety street lighting.

Power Production Committee*

Maintenance Plans For Power Units

By JOHN STOBIE
The Washington Water Power Co.

SYSTEMATIC PLANNING is essential in any organization if the utmost is to be realized from operations. This is true of sales, production, operation, maintenance or any other branch of modernized industry. Competition is so keen now that the individual or enterprise which is ready to do the right thing at the right time is the one that succeeds. It is not sufficient to be able to "muddle" through and eventually arrive at the right conclusion; it is essential that the conclusion be reached at the proper time.

Not only has the construction and maintenance department of Washington Water Power carried on its construction work in accordance with a definite work program, but for the past twelve years it has also planned a definite work program in advance for the maintenance of major units. From the start of this program several distinct advantages were noted. Some of these are as follows: the time at which repair jobs may be done is better controlled, fewer men are required to keep the system in first-class working order, cost of repairs is reduced, better service to customers is provided, plant efficiency is increased, and company-employee relations are improved.

Before entering into a discussion of the system planning and prearranging of shut-downs for the maintenance of hydraulic stations of the WWP system, it is felt that it would be advantageous to review briefly the methods by which the construction and maintenance work of the system is carried on in order to clarify some of the later discussion.

Construction and maintenance work pertaining to the power stations and major substations is handled on what we choose to call a central shop plan in counter distinction with the decentralized shops or local station plan. After many years of experience our company has found that there are certain inherent advantages and economies and much greater flexibility to be obtained when operating on the central shop basis rather than on the decentralized or local basis.

Our central shops are located in Spokane, which is near the center of the system, and consist of a mechanical shop, an electrical shop, a meter, relay and test shop and a carpenter and paint shop, each headed by a general foreman. These shops are all located in one building so very close cooperation between shops is realized. Large shop machinery and tools and equipment of a specialized nature are located in each of the individual shops, while small portable tools and general tools are kept in a common tool-room.

It is the experience of this company that for our conditions the centralized shop plan has some definite advantages over the decentralized shop plan. For example, it provides a closer knit organization; it provides better trained men (each a specialist in his trade); it provides better and more specialized tools and equipment; it provides a uniform standard of maintenance which promotes a uniform quality of work and it has been found that there is less dissension amongst the crews, and a higher state of morale exists.

Through constant association the employees in the central shop have become well acquainted with the personal habits and characteristics and qualifications of each other. Not only are the qualifications and aptitudes of the different men for certain types of work known to each other, but they are also recognized by their superiors. All this promotes harmony in the department and makes possible the best utilization of the crews, which in turn expedites work to be done. For example, if a particular job can be done best by welding, it won't be riveted simply because the man given the job cannot weld; or a job won't be given to a carpenter that requires a tinsmith; or the testing of a meter won't be given to a generator repairman. It must not be assumed, however, that these master craftsmen cannot do work other than that in which they specialize. They are also available for any general maintenance work that they are able to do.

The central shop on an average provides a higher type of repairman for each individual job because expert welders, machinists, erecting men, riggers, blacksmiths, electricians, oil switch men; transformer repairmen, generator repairmen, meter men, relay men, carpenters, painters and many other specialists in their trades are available to be used any place on the system on very short notice by systematic advance planning. Having men available with these qualifications eliminates the necessity for the general all-around repairman who from the nature of things cannot excel in any one trade. This all-around type of mechanic would of necessity be found at all except the largest individual power stations. The cost of maintaining a crew comparable to the specialists mentioned above at each of the power stations would be prohibitive except in the largest plants. Our experience has been that by maintaining a large central shop with the employees furnishing their own homes, and by pro-rating costs over the entire system, the cost of maintenance has been less than when the local crew plan

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was followed. A higher quality of work has also been maintained.

By combining the construction and maintenance crews under one head, greater flexibility and efficiency is obtained. This is due to the fact that when emergencies or other conditions require, a larger number of men is available for completing the necessary maintenance work in the minimum length of time. On the other hand if a rush piece of construction work is required, the same larger crew may also be available for this purpose. At other times the men can be shifted around to provide for their best utilization. If the construction work and the maintenance work were not coordinated under one head, the programs of the separate organizations would not lend themselves readily to this coordination. The reason for this is that each organization would have a specific program it would be trying to follow with a lesser number of men. To have comparable flexibility under separate organizations, the total number of men required would be larger and over-all costs would be greater.

The same reasoning holds for the availability of tools. In our central shops we have the best available welding equipment, lathes, drills, presses and other important equipment, along with a multitude of portable and hand tools. This equipment is always kept in tip-top shape and with its use the men can turn out work of the closest tolerance and of highest quality. Tools and equipment are either taken to the job, or the job is brought into the shop, depending upon which is the more desirable. Without a central shop a large part of our maintenance work would of necessity be contracted out because of lack of adequate equipment and personnel. Work done in this manner has never in our experience proved as satisfactory as when it is done in our own shops because it costs more, is of inferior quality and the delays in many cases are prohibitive. Work done in job shops is "just another job" to the workman, whereas in our central shop there is some inherent pride taken by each individual in the work he does, and he realizes also that he will be held accountable for his work.

A recent job turned out by a job shop for us may be cited as an example. A new set of large bearing oil rings was being made up for a synchronous converter which is located in one of the substations on our system. The company from which we could obtain the rough casting for these rings is equipped to turn out the rings and as we were operating short-handed at the time it was thought that it would be desirable to have the rings made up in their shop. After considerable delay, the rings were delivered and, although the bronze casting of which the rings were made was of suitable quality, the machine work was of such a poor quality that it was not considered safe to use them, so they were sent back for another finish cut. It was necessary to send them back a second time before they were entirely satisfactory. The cost of the time spent by our master mechanic and the purchasing department of our company in checking these rings, returning them and making phone calls, would offset the cost of making the rings if we had made them in our own shop.

Due to the fact that all of the construction and maintenance work over the entire system is done by the same skilled craftsmen, the work is of the same high quality and the same dependability of service can be expected from all units on the entire system. It has been our experience that when small local crews were maintained at each of the power stations, the maintenance work at the stations was characteristic of the crew doing the work and that work on different parts of the system was not of the same quality. In order for an entire system to be dependable, each part must be dependable and no one part any less so than another.

The central shop tends to create a better feeling amongst the employees for several reasons. The rates of pay of the employees are based on their qualifications and they are determined by the interested group. No man can be discriminated against by a disgruntled foreman. Work is steady throughout the year and an employee is seldom called upon to do a job for which he is not qualified. This fact very often tends towards greater safety for the workman. For instance, a meterman would hardly be "at home" building a scaffolding for the erection of some new bus work. A feeling of friendly rivalry which is always present in a larger group of men, eliminates lethargic individuals and brings about better efficiency as a whole.

All work done by the crews of the construction and maintenance department for other departments of the company, as well as that for its own account, is cleared through the office of the construction and maintenance superintendent. In this way closer cooperation with the other departments is maintained because there is a clear understanding of the job before there is any work done. This eliminates mistakes and cuts down costs. Also, by clearing all work through a central office it is possible to keep much closer contact with the work in the field, because the office knows where every crew is every day and also knows what that crew is doing. In knowing this we are able to judge whether or not the time of the crew and the material they use is charged to the right work order and thus we can keep better records of job costs. Handling all the work of the department through the central office enables us to dispatch our men more effectively because we know the qualifications of our workmen better, we know when the men are available to do the work and we know where the work will fit into our work program best. The last mentioned feature has become of very great importance and ties in directly with the planning and scheduling of construction and maintenance work on the system.

The department has been planning its work program in advance for approximately twelve years. At the outset, emphasis was placed upon work involving outages of generating units in the major power stations. The smoothness and efficiency with which that work was expedited by planning soon demonstrated the advisability of planning work which did not require outages of generating units. Finally, as time went on and as operating conditions became more complex, it was deemed advisable that all work to be done in power stations or transmission substations, of either construction or maintenance nature, as far as is practical, be planned and scheduled tentatively a year or more in advance.

Due to the demand for more power for war industries, the interconnected power systems of the Northwest have been loaded to near capacity. As their part in the war effort these companies are endeavoring to furnish the very best service possible to their customers. Therefore, it has become expedient to coordinate the maintenance work involving outages of generating units to insure that ample capacity is available on all of the systems at all times. To give this desired result a greater percentage of generating capacity must be available a greater percentage of time. It was found that the planning of maintenance work which we have been doing lent itself admirably and dove-tailed well with the maintenance program which we contemplated carrying on in conjunction with the other utilities with which we are interconnected. Some of the reasons for this excellent coordination are: we have centralized the control of the work of the twelve power stations so that a uniform method of procedure is followed; we have also centralized the cost accounting of our work, the

recording of authorization for expenditures, the writing of job reports and so forth. With the above factors under control, we are prepared to go into conference with the other organizations, having our information fully in hand, well coordinated, tabulated and briefed.

The method of operation followed is simple. All of our generating units and the various structures and items of equipment are inspected systematically on an annual, semi-annual, monthly, or other periodic basis, depending upon previous experience. These inspections are made by the master mechanic of which we have two—one for the Spokane River stations and one for all other stations; or the construction foreman, depending upon the nature of the work. At these inspections, it is the practice of our company for the superintendent of construction and maintenance to be present to make personal observations, or, in his absence, for one of the junior engineers from his office to be present. After the inspections have been made, reports of the conditions found with a brief review of previous experience as obtained from previous reports, previous costs of work, previous time on the particular jobs, are prepared together with preliminary estimated costs of contemplated further work which may be required. After the previous work has been reviewed, tabulated and preliminary estimates of proposed further work have been prepared, a conference is held in the office of the construction and maintenance superintendent at which are present the master mechanic, construction foreman or other supervisory fieldmen who may be concerned, also the junior engineer to whom the specific responsibility has been assigned, together with the budget estimator and chief technical clerk. The work under consideration is fully discussed, all the angles pertaining to the job are brought out, the various methods of procedure are outlined, materials to be used discussed, tools and equipment necessary to do the job considered and finally a decision is made as to the best method of procedure. We feel that this plan definitely tends to reduce not only unnecessary expenditures, but also unnecessary outages, which *also mean money*, due to loss of revenue.

Probable time limits within which the work should be done are then discussed. We must decide whether a job is to be done in three months, six months hence, or whatever the time may be to get the most economical use of the piece of equipment. In other words, we want to plan within limits the maximum length of time which a job can be postponed economically and the minimum length of time it should be deferred to fit in with the program of the interconnected systems.

Having reviewed all the circumstances, a decision is reached as to when the work should be done. The job is then turned back to the chief budget estimator who prepares the necessary "Authority for Expenditure" with a full description of work to be done, purpose of doing it, etc., and final estimates ready for approval. At the same time the responsibility of working out a schedule for the work is assigned to the engineer in charge of the prearranged maintenance program and he in turn contacts the operating engineer of the company and others concerned to determine a time on the maintenance program when the proposed jobs can be done, taking into consideration the capacity of the unit to be shut down, the loads to be carried, other work to be done at this time, proposed transmission line work, customer requirements, etc. Other jobs of lesser importance, which have been brought to our attention from time-to-time through our maintenance foremen or by the station foremen are scheduled to be done at the same time as some of the major work, or are dove-tailed into the work program for short shutdowns at off-peak loads. After the above details have been worked out and the tentative maintenance schedule for our own company adjusted together with the necessary authority for expenditures for the contemplated work, the whole is submitted to the manager of the power supply department for his approval in total, or with such modifications as he may deem necessary.

Having thus completed our part of the planning of the tentative schedule, we are in a position to go into conference with the other interconnected operating companies and make such adjustments as will best meet the requirements of all concerned. Our company has operated on this basis within our own organization for approximately twelve years and now has a smooth working organization with the members doing their part and cooperating to the fullest extent.

We might add that on our system the station foremen, while in charge of the plants, are primarily concerned with the efficient operation of the stations, which we consider is of utmost importance and of sufficient responsibility to exercise their full time. The actual construction and maintenance work is therefore handled entirely by the construction and maintenance department. We feel that the segregation is essential and that the work can be dispatched better by this procedure as each department can give full attention to its own field and thus render the maximum efficiency. Nevertheless, when any important piece of work is contemplated, the station foreman or power station superintendent is informed of the situation and his opinions given due consideration in working out the program, but the actual carrying out of the work is done entirely by the construction and maintenance crews whose foremen report directly to the general office and not to the station foreman.

In planning the system maintenance program we are able to utilize the maintenance personnel to the best advantage because we are able to assemble the right men and the required number of men qualified to do the work in hand. This prevents the work from dragging, or having too much overtime spent on it, or being overburdened with too large a crew. As more and more of our men are being called to the armed forces and to war industries, it is becoming highly essential that we use our maintenance personnel in the most efficient manner.

System planning also enables us to coordinate shutdowns on generating units with favorable load, water and weather conditions. For example, shutdowns on the generating units at Chelan are scheduled to be done during the low water period on Lake Chelan and high water period on the Spokane River system. Also, such jobs as painting of headgates are done during the hot season in order to get a better bond between paint and steel. Many of the jobs requiring shutdowns on generating units are scheduled to be done on weekends when the load demand is lower, while some others are scheduled to be done during off-peak periods, such as prior to irrigation season. A maximum of generating capacity is kept available on the system at all times in this way.

For convenience and a ready reference, the system work program is plotted on two charts which show work which we contemplate doing over a period of six months. One chart is for jobs requiring shutdowns of generating units and the other shows jobs not requiring shutdowns of generating units. The construction of the charts is substantially the same. The one involving shutdowns of generating units gives a description of the work to be done, the number of the unit or units upon which the work is to be done, the capacity of the unit, the station in which the unit is located, the date work is to commence and the number of days it is estimated that are required to do the job and the actual days in elapsed time required to complete the work. These scheduled jobs are indicated on the chart by dotted lines. When the work is completed, a solid line is drawn on the chart show-

ing the actual time during which it was performed. It may be of interest to note how closely the lines showing the actual work with the proposed work coincide, which is an indication of the effectiveness and accuracy of the planning. On the other hand, deviations do not necessarily mean that the planning is not working effectively, as minor adjustments in time may have been made to meet unusual conditions on our own system, or to fit the work in better with the general program of the interconnected systems.

The chart showing jobs which do not require shutdowns gives a description of the job, the station at which the work is to be done, the date on which work is to commence, the estimated time required for completion and the actual days elapsed time required. It might be added here that the jobs shown on the charts consist of those of major importance which have been discussed in the office of the construction and maintenance superintendent as described earlier, and those of minor importance which have been brought to our attention by the general foreman, the master mechanic, the job foremen or by the power station foreman. The notations of minor jobs are accumulated through the year and noted in a "tickler file" which we keep for this purpose. Reference is made to this tickler file when the advance work program planning is in progress and the jobs which it seems should be done during the period for which we are planning are included in the program. When fitting the minor jobs into our program, we again take into consideration the other work to be done, load conditions, customer requirements, availability of men and the season of the year. The jobs of major importance form the "backbone" of the program, while the jobs of minor importance fill out the program.

Reference is made to the charts each week and the foremen are informed as to whether or not the work is progressing as to schedule and are notified of work which is scheduled to be done next. Materials and tools are then collected or purchased in advance so that no time is lost in getting started on a job. After all these preliminaries are completed, the "shutdown" order and final "go ahead" for the work is cleared through the office of the construction and maintenance superintendent.

In conclusion, by coordinating the maintenance program planning of interconnected systems, a better continuity of service over all of the interconnected system is insured because work can be so arranged that the majority of generating capacity will be available at all times and a greater water-kilowatt-hour efficiency may be obtained by the interchange of power.

Longer shutdowns of units may be had without serious effect on service by interchange of power between systems. All in all, advance planning of maintenance work as practiced over these years on the Washington Water Power system has made it possible for us to meet the increased demand for power without sacrifice in quality of service or increasing the number or length of unit outages notwithstanding the continuous loss of highly skilled men to the armed forces or war industries of our country.

Discussion

E. H. COLLINS, chairman, asked if the companies maintained a central shop or if they did most of their generator maintenance at the plant.

R. C. SETTERSTROM — The Montana Power Co. has more shop facilities at Great Falls and Butte than at any of the other plants. The size of the job is the determining factor as to whether the work is done in a central shop or at the plant. We take advantage of what facilities we have to do the work in the most economical manner.

COLLINS—We weld our large runners at our plants, but take the smaller work to the central shop. We do most of our own shop work, finding this the most satisfactory.

STOBIE (in answer to questions)—Yes. We have specialists in certain lines of work.

When we shut down, we do all the work needed to be done at that plant—for instance, on generators, oil circuit breakers, disconnects or other equipment.

(In answer to question about the cost of transporting equipment to the central shop for repairs)—We haven't analyzed this cost specifically. We would have to have a large crew and a lot of equipment at the plant to do this work there.

COLLINS—The central shop maintains a complete line of good tools and trained personnel. We get better work out of the central shop than if we tried to take the personnel and tools to the several plants. This outweighs the cost of transporting the equipment to the shop.

We minimize emergency work by planning our maintenance in a routine way. This planning helps to keep the work moving, and we are through with the work when the peak comes.

C. D. RANEY—Most of our plants are within 40 mi. or easy hauling distance of our central shop.

J. C. HENKLE—In Portland General Electric Co. we schedule our major maintenance and repair work in advance. We have a combination maintenance and construction crew. Sometimes we have to sidetrack maintenance work to give way to pressing construction work.

RANEY—(In answer to question about silver plating switch contacts) — We have not tried silver plating yet, but are considering it.

JOE HELLENTHAL—We have been silver plating switch contacts for the past two years whenever we have had a chance, particularly where the switch doesn't open often enough to keep the contact clean. We do our own silver plating.

SETTERSTROM—We have done some silverplating.

O. L. LEFEVER—We have a superintendent who is a skilled mechanic and we have good shops left over from the construction days both at Ariel and at Condit. However, a good deal of our maintenance work is done at a local commercial shop. We have regular maintenance crews.

We are using silver inserts on switch contacts since we find these last longer than silver plating.

Inspection Programs For Steam Plants

By JOHN MacEWELL
Puget Sound Power & Light Co.

AS STEAM POWER in the Pacific Northwest is supplementary to hydro power, reliability of the steam plant during a war emergency becomes now of greater importance. In this locality, steam power is produced from standby stations and the use of their units or time on the line is now approximating operation similar to plants in the Middle West and Atlantic States. This paper, therefore, deals with our methods and conditions of inspection and maintenance in this region and refers to examples in other sections.

Due to seasonal changes, major repairs in the steam stations are handled only when the hydro plants have the most reserve, as in the spring of the year and early summer. Under present circumstances routine inspections and minor repairs are now performed during week ends and holidays. The work is divided into three main divisions such as boiler room, turbine room, and electrical sections. Where auxiliaries are electrically driven, the station service sections become part of the divisions of either boiler or turbine room. It is the custom in stations having large units to have inspection and repairs proceeding on a boiler at the time its complementary turbine is worked on.

Table I shows a time schedule for

inspections and maintenance in a steam station similar to the Shuffleton Plant.

Careful periodic inspections regardless of apparent conditions with an appreciable amount of preventive maintenance work should result in having all power plant equipment available for service the greater percentage of hours when capacity is needed.

In our case the units in our plant have had a service demand factor, power production only, averaging 17% during the last twelve years with outage factors of less than half of one per cent. Last year, the service demand factor on one unit was 60% and we expect this figure to be higher this year. If the synchronous condenser time is taken into account, the service demand factor for the last twelve years is 75.5% with an availability factor of approximately 99%. Referring to records published by the Edison Electric Institute, we find availability factors in the majority of plants in excess of 85% and some as high as 95%. These figures indicate, therefore, the dependability of the steam plant and what can be expected when used in connection with a large hydroelectric system such as we have in the Pacific Northwest.

Discussion

O. L. LeFever — We have a high boiler load in the winter due to our steam heating load so we do not start our maintenance and inspection program until about Mar. 1. At this time our hydro plants are running at full capacity. Our maintenance schedule depends on how much load we have been pulling during the winter.

E. H. Collins—Five years between the general overhaul of turbines seems a long time. Are there others who overhaul more frequently than five years?

LeFever—We open up our turbines every two years.

H. P. Currin—In Eugene we keep our boiler water hot by electric heaters supplied from our hydro plants so that we can keep our boilers ready to go on the line promptly. This also keeps the boilers from rusting.

C. P. Osborne—We have a one-year inspection interval for turbines, if we have been running every day and pulling load.

Wm. F. Hynes—If you use oil purifiers and take care of your oil, I do not think you need to worry about bearings short of a two-year period.

M. M. Ewell—We recommend inspection of Westinghouse machines every two years, but this may vary depending on the history of the machine and its previous inspection.

Table I—Schedule of Steam Plant Inspection

Boiler Room	Inspection	Maintenance
Boilers	Every year, interior and exterior	Inspection only
Furnaces	Every year	Every year. Baily blocks on water walls painted with chrome or every two years refractory around burners are replaced
Superheaters	Every year	No maintenance
Preheaters	Every year	Cleaning and touch-up spots with Apexior No. 3 paint
Fuel handling and Burners	Every year	Replace burner tips
Draft equipment	Every year	Paint inside of induced draft fans with high heat aluminum paint
Combustion control	Daily	Yearly cleaning and repairs made to push button contacts, furnace pressure regulator, fan vane control, fan motor control, and operating relays
Pumps	Every year	Check thrusts every year. Complete check of rings and motors every two years
Heaters	Every year	Use rubber plugs to clean scum off tubes
Piping	Every year for pitting in raw waterlines	Install new pipe every 10 years
Valves	Every year	Replace or grind discs and seats
Instruments	Every six months mechanical linkages checked	Yearly cleaning, worn contacts replaced and moving contacts polished. Driving motors cleaned
Turbine Room	**Inspection**	**Maintenance**
Turbo-Generators	Minor inspections every year. Generators meggered quarterly to check condition of insulation	General overhaul every 5 years, inspection of bearings and blading
Condensers	Every year for crystallized tubes, replacing same	No more crystallized tubes after installing strips of wood and keeping condensers full of water when operating generator as synchronous condenser
Generator air cooler	Every year for crystallized tubes, replacing same	No more crystallized tubes after installing strips of wood
Pumps	Every year	Check thrusts every year. Complete check of rings and motors every two years
CO_2 Fire protection	Tested quarterly on main generators and oil room. Checked every year for weight and leaks	Cleaning only
Electrical	**Inspection**	**Maintenance**
Motors in general	Daily for bearing temperature and oil level	Complete overhaul every two years which includes blowing out dust, cleaning windings, repairing worn insulation, and replacing commutators and bearings
Field rheostats and air circuit breakers	Every six months	Contacts burnished, mechanical connections checked and oiled
440 and 2,300-volt oil circuit breakers	Every year oil tested for dielectric strength, circuits are meggered to test condition of insulation	Cleaning and adjusting contacts, inspecting linkages and repairing circuits
13 and 55-kv. oil circuit breakers and transformers	Operating mechanism inspected monthly, oil tested for dielectric strength yearly	55-kv. oil circuit breakers overhauled after a specified number of interruptions under load. Commutators and breakers cleaned on motor operated switches monthly
Storage battery	Gravity and temperature of pilot cells taken daily. Voltage and gravity readings of each cell taken monthly	Replace every 10 years
Building equipment, elevator, rolling doors, skylights	Every six months	Cleaning and oiling

J. H. Siegfried—We have one steam plant which we have to keep up to scratch. We check the turbines every year. If everything is all right on one inspection, we let it go for another year. We clean the generator at this time.

William S. Hill—At Grays Harbor we have been lifting the covers of our turbines every year and we take a picture of the interior. We find this useful for comparison with previous years' pictures. We are now buying from Bonneville and running our steam at low load factor. We buy Bonneville power by the kw-yr., and so use it for our base load, using our own plants for fill-in and peaking. We have run a 5,000-kw. machine at about 1,000 kw. This is hard on the machine.

Collins — Now under war conditions, we may wish to revise our schedules to inspect turbines oftener.

Electrical Equipment Committee*

Northwest Utility Coordination

A report of the Systems Engineering Sub-Committee**

By L. B. COWGILL

This paper was presented at the meeting of the Engineering & Operation section and appeared in April ELECTRICAL WEST, p. 51.

Field Testing of Socket Meters

A report of the Meters and Services Sub-Committee†

By L. E. WIGGANS
Eastern Oregon Light & Power Co.

THE METER DEPARTMENTS of power companies have been faced with a troublesome problem of testing socket type meters. These meters, as a rule, are set not with the meter tester in mind, but rather in the most likely location with respect to the existing point of service. This has left the meter location a somewhat indefinite matter, usually determined by the distribution engineer, who has in mind the most economical point of service for both the customer and the company. In different geographical areas of our country, this presents a problem that has caused both the meter and accounting departments a great deal of concern.

It is not good practice to open a meter to the elements, and in most of our Western country the elements present a problem during a part of the year when most meters must be opened for inspection and adjustment. Another matter that is being recognized more today than ever before is the personal comfort of the meter tester. It has been proved that the accuracy of the meter is no better than that of the man who tests it, and a man cannot do his best work when temperature and other elements are against him.

Testing Methods

From answers to a questionnaire sent to member companies, we were able to compile most of the following information. One company is still making routine tests. This will be cut to a minimum soon. Other companies have not been doing routine testing for some time. The only tests being made are on complaints and such other tests as seem desirable. Four companies reported that nothing had been done to simplify their field testing of socket type meters. One company reported that a tester working in a suburban area had mounted a test panel on his stepladder. With this he was able to make his tests, especially of those meters mounted on poles and other high places, and it also permitted him to keep his test leads off the ground during wet weather.

One company reported that its testers had been having difficulty testing during the rainy season. They made several attempts to provide some kind of shelter over the test equipment and tester. The method they now use is to find some meter installation that is in a protected place and bring the meters in that area to this point, then return them to their original location. One company developed a test board located inside a car, which permitted testing in all kinds of weather. The procedure was to drive to a house and by the use of an extension cord from the car to the house, potential could be provided in the car and when the meter was removed from the socket a small jumper was used to provide service to the customer. Several meters could be tested from the one location by bringing them to the car. By using this arrangement, they felt that the meters were given an inspection which compared to the shop test. If a meter needed a major repair, it was removed to the shop.

One company has outfitted a trailer which is towed behind a car to a location where the tests are to be made. This trailer is equipped as a mobile shop to which a connection is made to the secondary of the distribution system. The meters are then brought to this shop, tested and then returned to their original position. This company has given serious consideration to equipping this shop with a photo-electric testing device which will make the trailer a very efficient means of testing meters in the field.

About a year and a half ago our company developed a method of testing socket type meters that has proved to be worthwhile. We felt that to remove the meters to the shop for test would cause a lot of extra expense, either for the accounting department which must keep these records, or for the operating department which would have to bring the meters in to the shop and take them out again. In either case a lot of extra work would be necessary. With this in mind we have worked out a very simple and practical arrangement which permits testing these meters in the driver's compartment of a car.

We made a bracket of channel iron, securely attached it to the cowl over the instrument panel and to this bracket we bolted an ordinary meter base. This base had slots in the back for easy removal when not in use. An ordinary 4-in. by 18-in. (outside diameter) fire hose reel was mounted on the car in such a way that 175 ft. of two conductor, No. 12, rubber-covered cord could be reeled on or off. This cord has proved to be large enough and long enough to reach any meter we have for test. It was found that by mounting the reel on the right side of the car behind the seat or on the run-

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ning board, there was no trouble in reeling the cord out or in. The end of the cord next to the hub of the reel was attached to a terminal block, also mounted on the reel. The outer end of the cord was attached to a plug made up by using the base of a socket type meter, the contacts being left and jumpers used to tie these contacts together. The cord was attached to this plug in such a way that when it was inserted into the meter base the customer had service, and potential was in the car. The plug was insulated so that when a metal cover was used the equipment was free from grounds.

In testing, we use the following procedure. The meter base is set in position on the bracket, and a two wire jumper is used to connect the contacts of the meter base to the contacts on the reel. The test jack is inserted in the base in the same way it would be done on the customer's premises. The portable test meter and phantom load is placed on the seat and connected to the test jack in the same way as it would have been done at the house. The tester takes the plug end of the cord and walks to the house; after removing the meter he plugs in the cord, which restores service and provides potential in the car. Then he takes the meter to the car and plugs it in the test jack, connects his jumper to the contacts on the reel, and now makes his test in the same way he would if the meter were at the house. After the test has been completed, he takes the meter back to the house, removes the plug, and replaces the meter, seals it and then takes the cord back to the car. The cord is then reeled up and the car is driven to the next test location. By using a blank test plug all of the meters in a given area can be tested from one set-up by simply inserting the plug into the base to restore service to the customer while his meter is out of place. The test leads need not be disturbed until the end of the day and then they can be put away. This saves much time and wear on the equipment because once the set-up has been made, the only changes needed occur when several types and sizes of meters are tested.

Most companies still have a large number of the older type meters in use. One of our testers has been testing these in the car by using short jumpers for connections. However, it is but a small job for the tester to remove his test equipment from the truck and make these tests at the meter location in much the same way as they always were made.

We have found this new method to be much better and more convenient than the old in testing meters in out-of-the-way places. This is especially true in the case of pole meters and meters that are located in buildings where boxes and material are piled in front of the meter installation. Polyphase, and two or three-wire, single-phase meters are tested with equal ease, as no additional connections are necessary.

We have found that 25% to 50% more meters can be tested and this done more satisfactorily in either winter or summer, raining or snowing, than we were able to do by the old method. This entire equipment can be installed in a car for as little as $25. After the day is done, the test equipment is put away and the car is then free for other use.

Maintenance Plans For Emergencies

A report of the Operation and Maintenance Sub-Committee*

By W. C. SANDER
The Washington Water Power Co.

MAINTENANCE is a familiar term to all of us who are charged with or interested in the production of electrical energy. From the time a power plant or substation is constructed and placed in operation until it is finally dismantled, deterioration and wear and tear are constantly at work. Maintenance is the counteracting program that replaces and renews that which is lost through operations.

Maintenance may be roughly divided into two parts—normal maintenance and emergency maintenance. It is our intention to touch mostly on the emergency part of the subject, as that phase is the one with which we will be most concerned in the near future.

Normal maintenance and repair in the past have largely been undertaken with an eye on economy and satisfactory operation over a long period of time. Thus the maintenance and repair policy in most cases in the past has been predicated on the principle of restoring the equipment to a first class operating condition. Under this procedure only secondary consideration has been given to the type and kind of material used.

Since the advent of the emergency caused by war, a great many of the maintenance practices exercised in the past will have to be suspended or at least greatly modified. Utilities, as well as all other industrial concerns, will be required to conserve materials, especially those required for the war effort. Even with this conservation program we will be faced in the near future with a shortage of these materials and the inability to secure them will tax the ingenuity of maintenance engineers all over the country in order to maintain equipment in repair and service.

What can be done to maintain service during the time that equipment is being repaired is rapidly becoming a grave problem. In some cases where equipment fails, it may be necessary in the near future to substitute available materials to effect an emergency repair in order to get equipment back into service until the standard repair materials can be obtained. In other cases the maintenance of service will have to be accomplished by overloading the remaining equipment or robbing equipment from some other less vitally concerned locality.

Labor for repairs may also be a vital factor in effecting repairs. In normal times there is a reservoir of unemployed technical workers from which experienced men can be drawn for emergency work, particularly in large centers of industrial activity. The ranks of the available manpower, including both skilled and unskilled labor, is being depleted very rapidly by the demands of the war program. Also many of our own key men have already joined the armed forces or have gone into war industries. The loss of these men is bound to cause delays in making repairs quickly. This means that those left must redouble their efforts and do more clear, concise thinking and planning in order to keep ahead of the job.

The picture of the future looks rather foreboding. Furthermore, all of this comes in the face of rapidly increasing loads due to the war effort. The amount of load growth on each of our systems is hard to predict; however, it can be anticipated that much of our equipment will, before this emergency is over, be stressed to the limit of its carrying capacity rather than its rated full capacity. Such conditions as these lead to greater required maintenance and repair work.

In the past we have carried heavy overloads on some of our equipment. However, in most cases these overloads have only been for short periods of time during peak loads. While these

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short period overloads can be successfully carried by the equipment without serious damage, a close watch should be kept on the temperatures to insure against any ill effects. In the near future, however, due to the lack of equipment, repair materials and increased loads, these and even greater overloads may become a regular operating condition for this equipment. Therefore, in order to keep the operating temperatures below the danger point, some additional provision will be required for cooling the equipment.

In a number of cases already we have installed water cooling coils in generator bearings. While these bearings have not been running dangerously warm, this installation was made to insure more favorable operating temperatures during the period when the units are loaded to capacity and high ambient temperatures prevail.

Also, in view of the increasing loads, ventilation was improved at one of our power stations during the past year. The load, on the four 3,000-kva. generators at this station during the period of high ambient or outdoor temperatures in the past has been reduced in order to maintain lower unit operating temperatures. The room temperatures during this period have been reported to be as high as 118° F. or 47.8° C. This high temperature is caused partially by the ambient temperature and partly by the radiation of heat from the units themselves which are of the open type. As there were no thermometers on the units at the time of these high room temperature reports, it is estimated from tests which have been made since that if the units had been carrying full load, the temperature of the hottest unit would have been approximately 108° C. or 215° F. These temperatures are not based on hot spot temperatures from imbedded thermometers but are iron temperatures recorded from thermometers puttied to the iron at a representative point.

According to an article by F. A. Annett in the April issue of *Power*, "Turbine generators rated above 750 kva. which have their stator winding temperatures measured with temperature detectors in the slots, the standard temperature rise for the winding using Class A insulation is 60° C. and using Class B insulation is 80° C. In all these ratings the ambient temperature is assumed to be 40° C. or less, thus based on this ambient a safe maximum temperature for units with Class A insulation is set at 105° C. and with Class B insulation is set at 130° C."

As coils in the units at this power station are mica insulated, a Class B insulation, a temperature of 108°C. should not be excessive according to this information even though the temperatures were not obtained from imbedded thermometers and provided that the design of these units is comparable to those of present day design.

In order to attempt to improve temperature conditions, six 48-in., 18,400 cu. ft. per min. fans have just recently been installed. The fans are so located in the building that four fans are used to force cool air from the river side into the plant and two fans are used to exhaust hot air from the building through the roof. Exact figures for the gains are not available at this time, but from observations after four of these fans were installed some improvement has been obtained in operating temperatures. More information will be available when complete load and temperature tests are made for this station.

Not only will power station equipment temperatures be affected by increased loads but substation equipment as well. Oil-insulated self-cooled transformers which in the past have been operating at full load capacity or nearly so, and which are installed in localities where high ambient temperatures exist, will have increased operating temperatures with heavier loads. In the past some of these operating temperatures have been on the border line with a small factor of safety. With increased loads we know that these maximum temperatures cannot be tolerated and some auxiliary form of cooling will be required. In some cases cooling can be accomplished by a fine spray of water on the outside of the tank or by installing fans to blast air through the cooling radiators or in some cases it may require both.

The effect of installing fans to blast air over cooling radiator surfaces has been tried and tested and the gains have been pretty well determined along with what can be expected in increased load-carrying capacity without exceeding maximum temperatures. There are many variable factors affecting the use of water spray such as water temperature, wind encountered, humidity, type of transformer, etc. But we do know that something can be gained because the water will evaporate and have a definite cooling effect.

There are also other changes in transformer design which can be made in the field which will allow additional load gains to be made, such as installing additional radiators and relocating radiators on older type transformers so as to place the radiators in the path of prevailing winds.

We have relocated radiators on five 1,800-kva, 60/13-kv. transformers at one of our substations on which the fabricated radiators, one on each side of the transformer, were parallel with the tanks. By removing these and putting the radiators in a perpendicular plane to the tanks the prevailing westerly winds will have a chance to blow through the radiators rather than past them.

The reduction in temperature due to the change in radiator location only is not obtainable at this time because when the radiators were relocated the cooling coils, tank, and core were cleaned.

The question at this point may be raised as to what all this has to do with maintenance. Manufacturers have established the fact that increased cable and equipment temperatures beyond a certain point will cause a marked decrease in service life. Such a condition in turn is bound to increase the maintenance and repair work. It will therefore be a problem for the maintenance engineer to determine what life span might be expected for the equipment in service which is operating at or above the critical temperatures specified by the manufacturer and to attempt to determine a procedure to follow to maintain service should this equipment fail. Second, we must consider the added maintenance and inspection costs to keep this equipment in service due to increased transformer and oil circuit breaker oil sludging at the higher temperatures. Third, the old style bushings in some of this equipment will require more frequent inspection and testing due to increased stresses caused by the increased load and heat. Fourth, the rotating equipment insulation is apt to become damaged due to the expansion and contraction caused by variable load conditions. The greater variations in unit temperatures caused by heavier loading for long periods and light loading between times is apt to crack the coil insulation, and if not repaired will ultimately fail and damage other parts of the equipment.

Cable temperatures too, will be affected by increased equipment loads. The cable insulation life according to the manufacturers will be greatly decreased if the maximum temperatures exceed those specified for the different types of cables and greater maintenance and repair work will be required if some arrangement is not made to maintain proper temperatures.

As yet our company has not been confronted with high cable temperatures in duct banks or high cable temperatures from too high ambient temperatures because such conditions were eliminated in the original design. However, such problems may arise under the overloaded conditions and we are keeping in mind the possibilities of removing center cables in a duct bank in order to blast cool air through these, or the removing of cables from ducts

and placing them on the outside where they will be exposed to the air.

The problem of parallel cables in each phase where excessive temperatures in one cable has been caused by an unequal distribution of current between the cables has been encountered in one of our power stations. In order to correct this condition laminated iron reactors were installed on those cables, which, after being tested were found to be carrying the greater current and had the higher temperatures. The cables in these banks are so arranged that the nine cables required for the three phases are in one single row, nine high. Adjacent to this approximately 8 in. away is a similar bank of cables from the second generator. The inductance between these cables so distributed the current that the center cable of each phase was carrying very little current and the two outside cables of each phase were carrying the remainder, with the cable adjacent to the next phase carrying the most. The distribution of current was approximately as follows:

	Phase A (Amp.)	Phase B (Amp.)	Phase C (Amp.)
Cable 1	653	945	1,265
Cable 2	573	505	466
Cable 3	1,234	1,040	769
Total	2,460	2,490	2,500

Such a current unbalance would account very easily for from 8° C. to 10° C. variation in temperature between parallel cables. At some points the cable temperatures of those carrying the greater currents were above the specified 60°C. maximum. In fact, in some cases, temperatures were found as high as 62.5°C., all of which helped to warm the surrounding conduit and other cables.

Here again by being able to reduce operating temperatures, the life of these cables has been greatly increased, thus decreasing the maintenance and repair costs. It is estimated that the cables will now carry the maximum load of this plant without any of the cables exceeding the maximum temperature of 60°C. during the warmest ambient temperatures encountered at this power station, provided that they do not greatly exceed those encountered in the past.

Emergency Repairs

Our company as well as others has been confronted from time to time with emergency conditions from which many helpful lessons have been learned. Lightning is one of the most violent and damaging agents with which we have to contend. Every year lightning causes some damage to our system, the extent of which varies from year to year.

The year 1941 was the most destructive as far as the loss of equipment was concerned. The greater part of said damage was experienced in the Spokane area in which our central shops and load dispatching offices are located. During one of the particular storms trouble was coming so fast that it was nerve-racking to attempt to keep the system intact. However, during this time large parts of the system were temporarily segregated but through close coordination of the operating and maintenance departments part of the troubles were cleared and repaired more quickly than we at first believed possible.

Under the central shop plan the location of crews and maintenance equipment on the system is known at all times. When trouble occurs in a locality, the crew, consisting of skilled and semi-skilled men, closest to the trouble is dispatched to the location. As all crews are more or less familiar with all of the equipment on the system a quick inventory made by these men will determine the extent of the damage, how repairs or by-passes of damaged equipment might be made, and the information is passed on to the office for final approval and a decision. Several of such crews can, if damage is not too great, soon return most of the equipment to service in different localities in a very short time. However, when major equipment needed for service is damaged beyond the point of emergency repair, ingenuity is needed to determine the best procedure to restore this service.

Several cases of trouble from lightning occurred last year and within a very short period of time. The first to be discussed will be the damage resulting to our 29th Avenue Substation. When this particular storm came over the area, outages on transmission and distribution lines came in so fast that it required three telephone operators and a dispatcher for a period of two hours to take calls and attempt to dispatch equipment and men.

It is estimated that four or five lightning strokes entered the substation during this time and were of such intensity that two type H-3, 60,000-volt switches were damaged beyond repair. The lightning reduced each switch to a melted mass in the bottom of the cells which consisted of contacts, connectors, cables, and other miscellaneous items. The explosions blew open the cell doors and sprayed hot flaming oil on the floor and on other switch cell doors causing a severe fire with about one-fourth of the switchroom in flames. The smoke in the remainder of the room was so thick that it was practically impossible to see. Due to quick movements of crews dispatched to the scene the fire was extinguished before the city fire apparatus arrived.

At the same time lightning also entered two 60/13-kv., 2,200-kva. three-phase water-cooled transformers on the floor below. The explosion from this spread oil in the cells and over the floor in this section of the building. However this oil did not catch fire. These and other failures of other minor equipment caused a complete shutdown at this station for approximately three hours in order that needed repairs and cleaning could be done to get at least part of the equipment in service again.

The repairs for temporary service to major feeders were made to oil circuit breakers by consolidating the parts of different damaged switches to make one good switch. When the substation was finally put into service only two-thirds of the original capacity was available. Because this station was not loaded to its maximum capacity, it was possible to restore service to all lines after a period of approximately six hours.

The only redeeming factor was that it had been planned for some time to abandon this substation as soon as the remaining materials could be installed in the new Sunset Substation. However the thing which prevented putting this substation into operation was the lack of control cables for the 13-kv. distribution feeders. Work was started immediately gathering all of the overcurrent and ground relays available on the system. These were assembled, tested, set, and mounted inside of waterproof boxes. They were then set up on temporary hangars near the switches and connected to bushing current transformers in the switches. In approximately two weeks practically all of the load was supplied from the new substation without a mishap.

Shortly after this storm two transformers on our system failed apparently from overload and from lightning. Both of these transformers were 650-kw., 60/2.3-kv. capacity. A quick inventory of available equipment revealed that amid the equipment not damaged at the 29th Avenue Substation were two water-cooled 60/2.3-kv., 650-kva. transformers which were for indoor operation however.

Both sets of transformers were removed to our transformer repair shop. The damaged cores and coils were removed from the outdoor type self-cooled cases and the core and coils from the water-cooled transformers were installed in their place. One of these sets of core and coils required only minor alterations to leads and core lifting facilities, while the other replacement required a new base, as well as the other changes. Thus the required repairs to these transformers were done in approximately one-fourth the time which would have been required had it been necessary to order and receive factory parts to effect the

repair. The total cost of labor, new material, transportation, and cartage was $637.72 for one transformer and $701.38 for the other.

Another emergency repair which was performed on our system is also worthy of mention. A 19,400-kva., 2,800-amp. 4,000-volt generator failure occurred at another of our power stations approximately two weeks before Christmas at 4:30 p.m. on a Tuesday. As soon as possible after the unit was shut down an inspection by an electrical crew revealed that three top and three bottom coil bars had been completely burned off and the laminated iron damaged to the extent that a section was destroyed three slots wide by 3 in. deep by 3½ in. long.

The damaged section was cut out and a dove tail shaped slot was cut into the undamaged laminations. New pieces of lamination were then cut to size and fitted into the openings where the damaged pieces had been removed. After these were all fitted and in place the two clamp bolts which had been damaged were repaired and this section was securely clamped in place. The coils that were damaged were removed and replaced with spare coils which were on hand.

The time required to make the repairs was less than one week and the total cost which included cleaning and repainting the remainder of the coils was approximately $2,000. If the damaged laminations had been replaced rather than repaired, it would have taken at least three to four times as long to effect the repair and would probably have cost approximately $5,000.

Increased system demands have required the rearranging of substation transformers in order to meet these demands. At one of our substations a 6,000-kva. transformer bank is needed during the seasonal irrigation load while during the remainder of the year a 1,250-kva. bank is sufficient. As another substation was troubled with overloads and a transformer failure, it was felt best to move the 6,000-kva. bank to this location in order to allow the full capacity of a connected generating station to be utilized on the system.

As there were two 650-kva. indoor type water-cooled transformers available with the proper potential at the 29th Avenue Substation which had been almost deprived of any load due to the installation of a new substation, it was decided to convert these into outdoor type water-cooled transformers. In order to do this it was necessary to discard all of the old indoor type bushings and fabricate adapters on the sheet metal covers so that outdoor type bushings could be installed. The bushings which were used consisted of 60-kv. outdoor type for the high side, which had been removed from other outdoor transformers which had failed and some spare 15-kv. oil circuit breaker bushings for the 6,900 to 2,300-volt side. These transformers have given trouble-free service since they were cut in approximately one year ago. The length of time required to convert each transformer was about two weeks and cost approximately $310 per transformer.

In another case a grounding bank was required at a substation in the Coeur d'Alene country. Rather than purchase a new grounding transformer bank, three 625-kva. indoor type water-cooled transformers from a previously abandoned power station, were converted from indoor to outdoor service and used in their place.

There are many other cases where trouble has developed on our system and by making a slight change in the transformer or oil circuit breaker covers, or by purchasing or fabricating adapters, bushings of the same capacity and potential but of a different manufacture have been substituted in order to get strategic equipment back into service as soon as possible.

Following is a list of transformer conversions from indoor to outdoor and water-cooled to air-cooled, made by the Idaho Power Co. along with the cost of doing this work. This information was forwarded to us by R. D. Jefferson, superintendent of substations:

"Three 100-kva. 66/2.3-kv. from indoor to outdoor. The cost of this job was $2,368. This change was made in 1928. This bank has never given any trouble and is still in good condition. The cost of this job is rather high and is accounted for by the fact that it was necessary to weld an extension on the top of each tank to provide the additional room required below the cover for the extra length of the outdoor bushings. These cases were round with no corrugations and of approximately ¼-in. iron.

"Three 150-kva. transformers, 44/-2.3-kv., square corrupgated iron cases with cast in base and top. The cost of this job was $943. This cost includes high and low tension bushings and cast iron covers in place of old covers. This change was made in 1931.

"Three 200-kva. 66/6.9-2.3-kv. indoor transformers of the old square corrugated side type with cast in top and base. In order to obtain sufficient room for the outdoor 66-kv. bushings it was necessary to change the cover also. The cost of this job was $2,420 and included new oil. This was a 1931 job.

"One 6,600-kva. 3-phase Inertaire type booster transformer; water-cooled. Changed to air-cooled. The case on this transformer was smooth. Two radiators were added to one side which, according to factory information, was sufficient. The water coils were left to provide additional cooling for overload capacity. The cost of this change was $430 and was made in 1938.

"Three 1,250-kva. transformers were changed from water-cooled to air-cooled. This change was made by purchasing new tanks with radiators. The old bushings were used. The cost of this change was $3,555 for tanks, $21 for miscellaneous material and $332 for labor, making a total of $3,908. This was a 1941 job.

"The cases removed were tall corrugated with top and bottom cast in. Later these cases were used by installing the bushings, and cores from a 1,000-kva water-cooled transformer in each. In this case it was necessary to raise the terminal boards to a more accessible position on account of the taller cases. The water coils were left in position in order to provide additional cooling for an overload. Due to the difference in size of the cases, considerable additional oil was necessary. The cost of this change amounted to approximately $1,074.

"We have used a spray of water on the outside of air-cooled transformers. A pipe ring was mounted near the top of the transformer and holes were drilled every few inches in this pipe. The water ran down the sides of the cases and was conducted away in a trough. This made rather a messy arrangement, but was effective in keeping the temperature down to a reasonable point.

"One customer on a bank of 44-kv. transformers closed the lower end of the outside double jacket and circulated water in the space between transformer case proper and the outer jacket. This was effective but was also very messy.

"In 1941 fans were used to cool a bank of 400-kva. indoor transformers that at times had as much as 25% overload. A fan was also used to cool a 150-kva. outdoor transformer that also carried a considerable overload at times."

The following information concerning the conversion of water-cooled transformers to air-cooled transformers was received from H. C. Miller of the Wolff Electric Co.

"Converting of water cooled transformers is not new as the writer has been doing this since 1915 by using various ways of making radiators, but the past three years we have developed radiators using flat tubing that have given excellent results where large size transformers are involved. We are able to convert practically any size transformer and hold the temperatures with-

in the standard range limits of 55° above the ambient temperature.

"The past two years we have converted transformers for several companies, the smallest size being 200-kva., 66-kv., and the largest one has been 4,500-kva. 57.1-kv. and many sizes in between these. In the past two years we have converted 28,000 kva. of transformers from water-cooled to self-cooled and all of these are in service at the present time pulling their full load without exceeding a normal temperature. We have also developed an outdoor type fan that can be installed on these radiators to increase the cooling where necessary, that operates from a thermostat in the oil in conjunction with automatic switches that start and stop the motors. These motors are especially designed for outdoor work and there is no additional housing required for them only a guard around the blades.

"The converting of each transformer has to be taken up separately as the radiation of a shell and core type transformer varies considerably, and the type of oil ducts and spacing varies considerably in different size transformers. Radiation of core type coils varies from 2 to 5 sq. in. per watt loss and has to be taken into consideration in the designing of the radiators that are placed on the tank to replace the water coil. The radiators required for each tank are then worked out from the radiation of the core and coils and the total loss of the transformer. This varies from 5.5 to 9 sq. in. per watt loss in the transformer and type of tubes between headers.

"The headers have to be baffled in order to slow up the circulation or the openings reduced into the headers in order to give an even flow of oil and slow the circulation to allow the oil to cool.

"The cost of changing these transformers varies from approximately 61c per kva. on the large sizes up to $2.18 per kva. on a 250. This, of course, depends on whether we have to furnish new covers and new bushings to make the transformers outdoor type. In many cases we find that we can use the present covers by making extensions and by putting special rings on them to adapt them to the standard new bushings, and in every case it is necessary to take up each transformer individually.

"Where radiators are put on these water cooled transformers, we believe that the oil should be changed to the lighter type of oil as the old oils used in water cooled transformers were considerably heavier and do not give satisfactory radiation."

In conclusion, it would be timely to stress briefly some of the conditions which will more than likely be encountered by all utilities at one time or another during the war emergency:

1. Lack of critical repair materials, delays in material deliveries, and overloads will be detrimental to equipment, which will ultimately increase the cost of repairs.

2. Equipment repairs will be made on the basis of restoring service and conserving material rather than on attempting to prolong the useful life of the equipment.

3. Greater loads must be carried by present equipment and old equipment with minor additions or alterations must be utilized to maintain service as well as to supply increased loads.

4. Substitutions for materials required to make repairs will be more frequently made.

5. Greater ingenuity must be exercised by maintenance men to cope with the twin problems of shortage of materials and lack of skilled labor.

Discussion

W. C. SANDER (in answer to question about the repair of damaged laminations in a generator) — We used a chisel to cut away the damaged laminations, then filed the edges down smooth. We then cut some lamination material we had on hand to approximate size and filed this down. We then painted the new laminations with insulating material and butted them in place.

JOE HELLENTHAL (with reference to transformer maintenance and repair) — We use a method of forced circulation of oil. We also use fans for circulating air through the cooling vanes. We have sometimes specified that new transformers be equipped with air blast equipment automatically controlled. This seems to be the most economical method of getting more transformer capacity. On a new 2500-kva. transformer, we can can get a 25% increase with forced air cooling; sometimes up to 30%. The cost of this is about $1 per kva. of increased capacity.

SANDER—The Wolff Electric Co. has air cooling equipment consisting of an outdoor type fan operated by thermostat to bring it on as the temperature rises.

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*Members of Apparatus and Design Sub-Committee—J. C. Henkle, Portland General Electric Co., Chairman; B. C. Electric Railway Co., A. Vilstrup; General Electric Co., J. F. Spease; Idaho Power Co., E. A. Woodhead; Northwestern Electric Co., Corbett McLean; Pacific Power & Light Co., R. E. Forman; Portland General Electric Co., W. E. Enns; Puget Sound Power & Light Co., A. Shipek; Utah Power & Light Co., D. L. Brundige; The Washington Water Power Co., C. E. Cannon; West Coast Power Co., Henry Berk; Westinghouse Electric & Manufacturing Co., V. B. Wilfley.

Automatic Circuit Breaker Reclosing

A report of the Apparatus and Design Sub-Committee*

By A. C. SCHWAGER
Pacific Electric Manufacturing Corp.

SINCE the practical application of reclosing circuit breakers dates back but a few decades, it could be assumed that the idea is of relatively recent origin. Upon closer examination, however, it is found that the first reclosing circuit breaker was known as early as 1891. The late Elihu Thomson, in disclosing the idea of the oil circuit breaker, also describes the reclosing feature. Fig. 1 shows a section through the reclosing oil circuit breaker shown in Thomson's patent application.[1] The foresight of this pioneer is astounding since he describes the usefulness of the device in being able to distinguish between temporary faults, particularly due to thunder storms, and permanent ones causing lockout. In operating principle as well as construction the device is similar to the rural line reclosers recently introduced by various manufacturers.

It must be assumed that economic factors as well as not too strict requirements as to service continuity delayed the exploitation of this early idea for fully 30 years, after which time-delayed reclosing circuit breakers were gradually introduced. Immediate reclosure, although applied generally only during the past few years, had some early advocates as can be seen from the AIEE annual report of the committee on protective devices, 1926[2] which reads in part:

"One group of operators which is rapidly growing prefers to have the breakers reclose immediately after the first or initial circuit interruption."

Progress was slow, however, as can be judged from a statement by Messrs. J. T. Logan and J. M. Miles, who have pioneered in the introduction of the present-day practice, according to which no commercial timers providing for immediate first and time-delayed subsequent reclosure appeared to be available as late as 1931.[3] The most recent development is the practice of single phase reclosing where each phase of a breaker is equipped with an independent operating mechanism, providing means for separately opening and reclosing the individual phases of three-phase lines.

Numerous tests on actual systems have established the lower limits of the

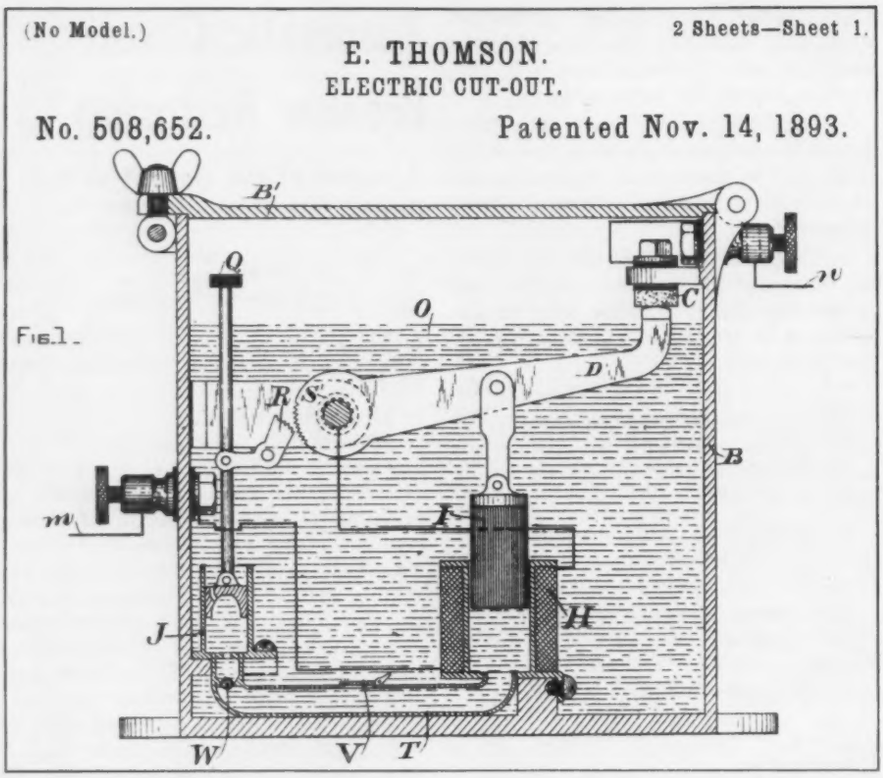


Fig. 1—Cross-section of circuit breaker patented by Elihu Thomson in 1893

reclosing time which is a function of the speed with which an arc becomes deionized. An extended series of tests on a 138-kv. system sets the minimum "deenergized" time at approximately 12 cycles in case of three-phase reclosing,[4] longer times being required for single-phase clearing and reclosing. These tests have contributed greatly to the recognition of the value of the practice of immediate reclosing. Recent generalized studies by various investigators have treated the problem with relation to various types of systems and tie lines, the conclusion reached in one of these shall be reproduced here:[5]

Three-Phase Reclosing on System Ties

"(1) The benefits to be obtained from reclosing are greatest for single-circuit lines, or simultaneous faults on double-circuit lines.

"(2) Three-phase reclosing is a very practical means for maintaining the transmission-line loading between interconnected areas when these areas have generating capacities of the order of at least four times the transmission-line loading.

"(3) With three-phase reclosing of single-circuit lines, a decrease in the clearing time for three-phase faults is as important as a decrease in deenergization time. Therefore, further reductions in the fault clearing time directly improve the stability.

"(4) With parallel circuits, the benefits to be realized from reclosing decrease with decrease in line length and with increase in the number of intermediate switching stations.

Single-Phase Reclosing on System Ties

"(1) Single-phase switching provides increases in transient power limits on single-circuit lines for line-to-ground faults which are not possible with three-phase switching; the difference, however, may be small if the interconnected areas have high generating capacity relative to the power to be transmitted.

"(2) The power limits of a single-circuit line are greater than a ground-fault neutralizer for extinction of line-to-ground faults than those which can be obtained with single-phase switching.

"(3) If the inertia constants of the interconnected systems or the connected capacities are sufficiently great, the practical advantages of single-phase switching may be negligible.

"(4) For line-to-ground faults, if single-phase switching is used, the time for deenergization is not particularly critical as regards its effect on the stability limits. Therefore, it is not necessary to strive for short reclosing time as is the case with three-phase reclosing.

"(5) The advantage of single-phase switching appears to be important only when reclosing is used on single-circuit interconnecting lines and when the generating capacity of one of the interconnected areas is not much greater than the load which must be transmitted.

"(6) Single-phase switching appears to offer no advantage over three-phase switching for faults involving more than one phase.

Single-Phase Switching for a Hydro Station Delivering Power Over a Single Circuit to a Large System

"(1) Single-phase reclosing makes possible the maintenance of stabiilty through self-clearing line-to-ground faults for normal line loadings and for short distances.

"(2) For longer lines and more heavily loaded circuits other means such as the ground-fault neutralizer may be required in order that the system may ride through line-to-ground faults.

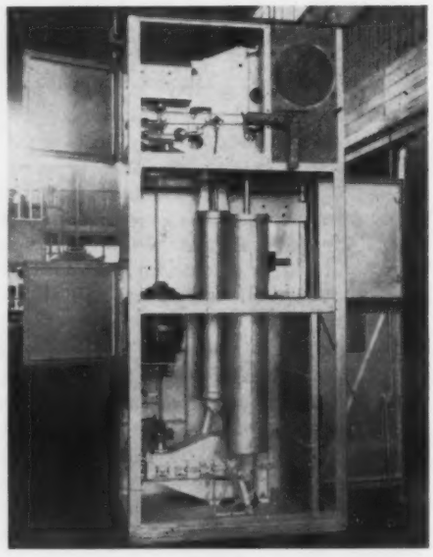
"(3) This type of system is not stable with either single-phase or three-phase reclosing of faults which involve more than one phase."

From the above it follows that circuit breakers providing a minimum reclosing, as well as a fast clearing time are an essential. Special operating mechanisms have been developed which are capable of operating breakers at high speed. A typical construction built by the Pacific Electric Manufacturing Corp. is shown in Fig. 2. This control is of the motor-wound, spring-actuated type producing 20-cycle reclosing and 5-cycle opening in conjunction with breakers up to and including 161 kv. The linkage is essentially identical to that of a trip-free solenoid mechanism in which the closing solenoid plunger has been replaced by a closing spring.

Distribution Systems—Present Status

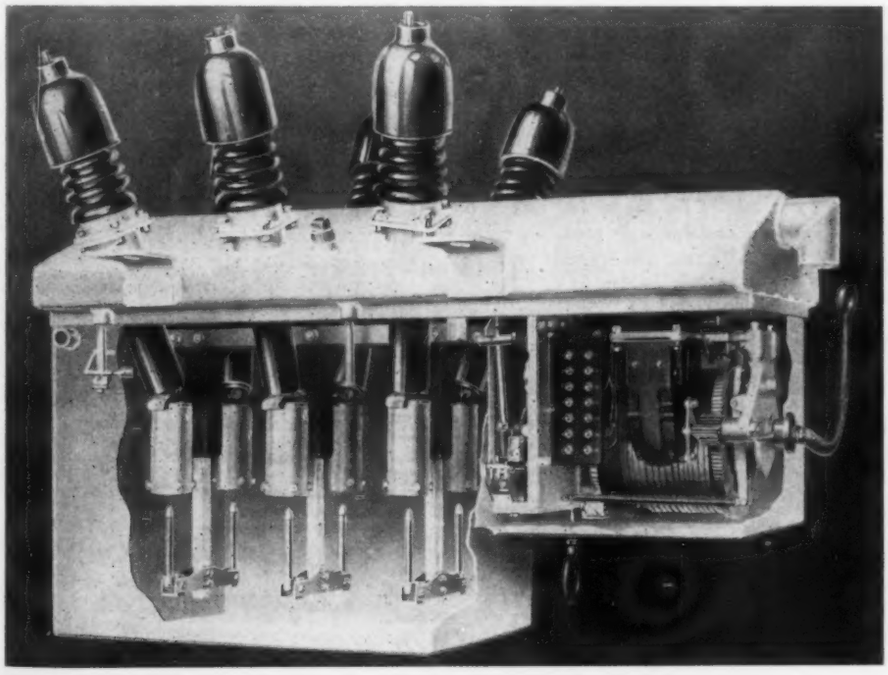
On distribution systems a similar extension in the application of reclosing and immediate reclosing circuit break-

Fig. 2—High speed breaker control mechanism of the motor-wound spring actuated type producing 20-cycle reclosing and 5-cycle opening



ers has taken place resulting in a reduction of outages on the system and in the confinement of an outage to the immediate vicinity of a permanent fault. Up to a few years ago the smallest outdoor circuit breaker for 15-kv. service had a current rating of 600 amp. and an interrupting rating of 50,000 kva. It was provided with standard protective relays operated through bushing type current transformers and made use of conventional reclosing timers. It soon became apparent that such a breaker did not provide an economical solution for many of the lightly loaded branches of rural distribution systems. An investigation showed that both 3-pole and single-pole breakers with a current rating of 100 amp., and an interrupting current rating in the range of from 1,000 to 2,000 amp., provided with simple but reliable inverse current-time tripping device would find a wide field of application. Reclosers of this class are now available. Fig. 3 shows a 3-pole, Fig. 4 a single pole device developed by the Pacific Electric Manufacturing Corp. Early costs studies on these reclosers brought out the fact that inverse current-time tripping with conventional relays was not economically feasible. A direct series trip coil was therefore resorted to. On the other hand it was realized that unless these devices had flexible and reproducible tripping characteristics their field would be greatly limited. The idea of using an oil dashpot in conjunction with the series trip coil had to be abandoned due to the variation in tripping characteristics with temperature changes. The use of escapement type delays provided an ideal and inexpensive solution giving selectivity closely approaching that of conventional relays. An idea of the accuracy of these escapements can be obtained from tests made during which five restorers were cascaded successfully under extreme temperature conditions with time intervals of approximately ½ sec., showing that close coordination is possible between adjacent devices.

Fig. 3—A three-pole distribution type circuit breaker of a type widely used on rural lines



Probable Future Trends

In the field of transmission systems it is felt that three-phase reclosing circuit breakers will be generally introduced where economic or operating advantages are to be expected; in addition there are likely to be many trial single-phase reclosing circuit breaker installations, whose performance data will clarify possibilities and limitations.

On distribution systems further developments can be expected. The restorers available have in many cases eliminated the less reliable fuses and it is likely that the benefits obtained from them will result in additional designs reaching practically the last protective link of the distribution system. A further reduction in current and interrupting rating requirements might produce a recloser approaching the size of a fuse cutout.

In a radial distribution system coordination of protective devices having inverse current-time overload characteristics is arranged in such a manner that the device closest to the fault responds. Operation of a device other than this would seem inconsistent with good practice. It has been realized but recently that reclosing offers an additional valuable selective feature. The overcurrent impulses due to reclosing operations can be used to select a device other than the most remote one to trip first, if this should be advisable. Such a condition exists when a branch fuse is backed up by a recloser. The overcurrent impulses can be made to select the recloser to trip immediately upon the occurrence of a sustained short circuit and to prevent its immediate tripping after the first reclosure, causing the fuse to blow.

Fig. 4—A simple and economical single pole distribution type breaker for use on rural feeders

An additional application of this principle is the selective opening of automatic disconnecting switching by means of the no-voltage impulses occurring during the open-circuited periods of the reclosing cycle.[6]

The above are but two isolated cases in which the selective property inherent to automatic reclosing breakers has been applied. It is not unlikely that a good portion of the future development in reclosing feeder circuit breakers will be due to a consistent extension of this feature.

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1—U. S. Patent No. 508,652.

2—Present Practices in Protection, AIEE Transactions, 1926 P. 877.

3—Inertia Relay "Anticipates" to Facilitate Reclosure, by J. T. Logan and J. H. Miles, **Electrical World**, April 6, 1940 p. 69.

4—Ultra-High-Speed Reclosing of High-Voltage Transmission Lines by Philip Sporn and D. C. Prince, **Electrical Engineering**, January 1937, p. 81.

5—Analysis of the application of High Speed Reclosing Breakers to Transmission Systems, by S. B. Crary, L. F. Kennedy, and C. A. Woodrow, **General Electric Review**, March 1942, pp. 173-185.

6—A Novel Reclosing Relay by P. O. Bobo, **Electrical Engineering**, December 1941, p. 1041.

Discussion

V. B. WILFLEY—The definition of reclosing time is important. There are two standard reclosing times: (1) The standard, in 30 to 60 cycles, depending on the voltage of the circuit; (2) fast, in 30 to 35 cycles.

There is not much interest in the first of the two, particularly on the higher voltage lines. Operating men, when they want automatic reclosing, want the fast reclosing.

There is a third ultra-high speed reclosing in 20 cycles, but no standard for this has yet been published.

Westinghouse uses compressed air mechanism with low energy to initiate the closing operation. It requires only two or three amp., D.C.

There have been interesting developments in coordinating automatic reclosing with fuses on branch lines.

The single pole reclosing of 230-kv. lines with the poles operated independently appears to be the best system. This takes care of single-phase line to ground faults, or two phases for a line to line short, or three phases for a three-phase short.

E. C. CURTIS—Some years ago, the emphasis was on fast opening. Now it is on high speed reclosing. There are many ways to accomplish this.

Formerly a relay was used; now it is accomplished by mechanism. G-E company is using pneumatic operation with air as the medium of interruption. This may develop along the line of using air not only to break the circuit but to open and to reclose the breaker.

The necessity for automatic reclosing decreases as the system grows bigger and has more tie-lines, if you speed up the closing time of the breaker.

Reclosers for rural lines are becoming increasingly desirable from the standpoint of saving the time of linemen sent out on transient faults. The manufacturers recognize the desirability of low-cost, reclosing devices, and we now have such devices.

The time element in reclosing should be determined by the nature of the system, and this requires an engineering study. Several papers have been written on this type of study. It is possible to make accurate determination of the needs of any system, but it does require a specific study of that particular system.

Transmission and Distribution Committee*

N. E. S. C. Crossing Requirements

By WILLIAM L. CONE and
CASSIUS C. GADDIS
Utah Power & Light Co.

This paper was presented at the meeting of the Engineering & Operation section and appeared in May ELECTRICAL WEST, p. 39.

Discussion

EARL BAUGHN, Washington Water Power Co. (written) — The rules for crossing clearances contained in the Fifth Edition of the National Electrical Safety Code cover 11 pages and in order to be certain that the minimum clearance is obtained at each crossing would involve calculations in considerable detail by someone familiar with the Code requirements and having available sag curves for loaded and unloaded conductor. To provide a guide for men engaged in laying out and checking crossings, a set of curves has been prepared from which minimum clearance can be read direct for the most commonly used wire sizes and span lengths.

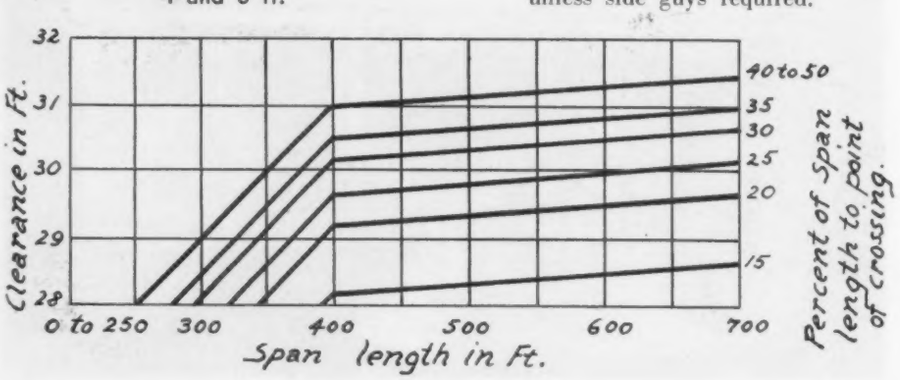
Slightly different answers will be obtained depending on the sag tables or curves used. The following curves are based on the sag curves for No. 4 copper prepared by the Copper Wire Engineering Association and published in EEI Publication No. F 9. Slightly less clearances will be obtained for No. 6 and No. 2 copper, but in order to avoid confusion it would seem desirable to use the same chart for all usual sizes of conductor.

R. S. DANIELS, California Oregon Power Co. (written)—This paper is of great help to anyone who uses the National Electric Safety Code. While the paper deals with crossing requirements, it explains many of the changes in the revised code dealing with stringing, guying and general clearances.

Some of the principal changes noted in the paper are:

1. Transverse loading reduced 50% for medium and heavy loading.
2. Addition of a set of "final" sags and tensions.
3. Limit of 60% in place of 50%, for loaded tension.
4. Limit of 35% for initial tension and 25% for final.
5. Head guys at crossings not needed unless side guys required.

The curve below is for crossing in medium loading areas over railroads where basic clearance is 28 ft. Similar curves can easily be made for heavy or light loading and for wire crossing clearances where basic clearances are 2, 4 and 6 ft.



*R. J. Davidson, Pacific Power & Light Co., Chairman, L. R. Gamble, The Washington Water Power Co., Spokane, Vice-chairman. Allis Chalmers Manufacturing Co., C. T. Hurd; B. C. Electric Railway Co., P. C. Gill; The California Oregon Power Co., R. S. Daniels; Eastern Oregon Light & Power Co., A. B. Olson; General Cable Corp., W. E. Wallace; General Electric Co., C. E. Canada; Graybar Electric Co., E. J. DesCamp; Idaho Power Co., J. F. Emery; The Montana Power Co., Cecil Kirk; Mountain States Power Co., W. Smith; Northwestern Electric Co., Bruce Aaron, D. A. Hord; The Okonite Co., H. M. Denny; Oregon State College, F. O. McMillan; Pacific Electric Manufacturing Corp., C. H. Cutter; Pacific Power & Light Co., A. E. Bond; Portland General Electric Co., W. E. Enns, H. R. Wakeman; Puget Sound Power & Light Co., F. H. Ferguson, D. F. Misz; Telluride Power Co., L. R. Fournier; Utah Power & Light Co., A. C. Kelm; The Washington Water Power Co., Earl Baughn; West Coast Power Co., Henry Berk; Westinghouse Electric & Manufacturing Co., C. E. Klaus; Thos. S. Wood Co., T. S. Wood.

6. Grade B replaces former grades A and B.
7. Safety factors on poles are increased.
8. Crossing clearances are based on "final" sags.

It has been recognized for a long time that wires do not stay where they are first strung, and the tables which have been added to show the "final" sag, or the sag which results after the wires have experienced the loading assumed are needed to show more nearly what the sag will ultimately become.

A. B. CAMPBELL—A great deal of engineering went into the revision of this code.

The paper mentioned that the fifth edition does not require guys in many places where the fourth edition required them. This saves considerable cost of construction and also saves future maintenance cost.

The differentials of 50 to 60% have been removed in the new edition, and 60% straight has been established.

The changes in the wire loading tables and factors of safety put these standards on a more rational basis. Generally speaking, the loading standards have been reduced to a more scientific basis, using weather bureau reports, and the factors of safety have been raised to conform to proper engineering practices. Thus these tables are more justifiable from an engineering standpoint than those in the old code.

For all grades of construction, the new code contains a table which tells when poles must be replaced.

(In answer to a question as to whether or not the railroads would make their specifications conform to the new edition)—The railroads originally asked that the old 1922 rules be used. These rules were more stringent than the old fourth edition. The railroads presented a minority report at the time the fourth edition was under consideration, but they removed their objections when the NELA and American Railroad Assn. agreed to get together. These organizations did get together and the result was that the railroad specifications were liberalized in many respects.

During the consideration of the fifth edition, many railroads seemed satisfied with the proposed revisions. They have agreed to make a study of the fifth edition and try to agree on crossing standards that will be mutually satisfactory to the power group and to the railroads.

WALDO E. ENNS—In the new edition, growing vines are listed as an obstruction on a pole. This is an advantage to operating utility companies.

F. H. FERGUSON—We need a coordination of state and national codes and railroad specifications.

PAUL P. ASHWORTH—It seems to me we should not have to dicker with the railroad companies on their crossing specifications. We have frequently got the railroads to accept the NESC specifications on crossings by simply standing pat. In the NESC we have a code based on engineering principals and approved by the Bureau of Standards. This gives us a pretty good case in court. We should, however, understand the code and know what we are doing, if we have to go into court or if we reach an agreement by stipulation.

Coordinated Fusing Plus Spill Gaps Gives Continuity

By C. N. TEED and J. F. SERVIS
Idaho Power Co.

This paper was presented at the meeting of the Engineering & Operation section and appeared in March ELECTRICAL WEST, p. 37.

Discussion

R. S. DANIELS, California Oregon Power Co. (written)—This paper presents a somewhat remarkable arrangement of fuses, ground-gaps and reclosing breakers for improving service on 12-kv. lines, reducing operating costs, and protecting transformers. This plan coordinates main line and branch fuses and substation switches and calls for ground-gaps at all transformer locations.

Increased frequency and severity of lightning storms has been noticed in recent years. Our experience in Southern Oregon and Northern California shows that severe storms occur at long and irregular intervals. We may have one or two years with severe storms in certain local areas, and then no more bad storms for 8 to 10 years in these areas. In one instance we had a new pole split before any wires were attached, and within a year a wire was burned down and guy breakers broken at an angle adjacent to this pole. That was 12 years ago and no severe lightning damage has since occurred in that district.

The paper points out that spill-gaps on transformer bushings protect the transformer but they allow the fuse to blow and also cause trouble from birds. Therefore, the gaps have been placed on the line side of the fuse. At various locations on the feeder, coordinated line fuses are installed, and the oil breaker at the substation is autoreclosing. If a lightning surge causes a gap to flash over, the breaker at the substation opens and immediately recloses, restoring the feeder to normal. If a tree branch gets on the line the substation breaker will reclose twice at 50-sec. intervals, then remain closed long enough to blow the line fuses which are nearest the fault. If the fault fails to clear, then the breaker will be opened within 4 to 15 sec. by induction relays and will stay open. This is a very ingenious arrangement, and the records as given in the paper show splendid results.

An example is a district served by 200 miles of 12.5-kv. line with 800 transformers which had been half cut over to the new scheme. During a severe lightning and wind storm no transformer fuses were lost where the gaps had been installed, but 75 transformer fuses were blown and three transformers were damaged on lines which had not been protected.

One disadvantage to installing such an arrangement is the fact that a special reclosing relay is required. This relay has been built by the Idaho Power Co.

I think that all of us who are interested in distribution should give serious consideration to installing this or a similar plan for line protection and elimination of interruptions in those areas subject to considerable lightning.

D. F. MISZ—In applying this system of protection, we must be careful not to drop off particularly important load. I am thinking of a rock crusher on our lines. If we have an outage when this is running, the rocks clog the machinery, which must be unloaded and cleaned out before the plant can start again. This costs them time and money.

J. F. EMERY—We have similar situation with irrigation loads in our territory.

HENRY BERK—Our problem centers on transformer protection rather than on protecting the loads on the line. Recently we have tried a double gap, the first open and the second enclosed in a horn-fiber gap. This system will catch about 95% of our lightning trouble and not blow the transformer fuses.

There is a combined fuse and gap that is cheaper than installing these devices separately.

EMERY (in answer to a question about the stress on the transformer)—We set the gap and our relays below the manufacturers' thermal ratings and ratings of voltage stresses on the transformer. I do not think there is any deterioration of insulation in the transformer.

Shunt and Series Capacitor Use

By WALDO E. ENNS
Portland General Electric Co.

THE PURPOSE of this paper is to show to what extent and for what reasons shunt and series capacitors have been, or are being installed on the distribution systems of the Northwest; significant points in the determination of where capacitors should be located; what disadvantages or troubles have been experienced in the use of capacitors. The paper includes tabulated results from answers to questionnaires sent to members of the Transmission and Distribution Committee. However, due to the small number of capacitors with any service record in this area, data on operating experience are limited so that engineering experience obtained in the study of applying 15,090 kva. of shunt capacitors to the distribution system of the Portland General Electric Co. is included.

Results from Questionnaires

Table I shows the reasons for installing 49,170 kva. of shunt capacitors on the eight power systems reporting shunt capacitors. Analysis of this tabulation shows at once that the large increase in their use is to meet system reactive requirements and to release generator capacity by reducing the reactive load on machines. Table I is supplemented with brief comments taken from the company reports.

Table II shows the reason for installing 1,370 kva. of series capacitors on the lines of the five companies reporting their use and is followed by a brief of the comments included in these reports.

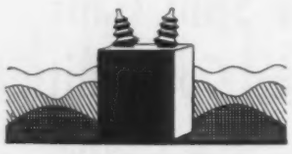
Comments on Installations Reported in Table 1

Company A—The 1942 program covers installation of 20,000 kva. of shunt capacitors made up of 15-kva., 2,400-volt, single-phase outdoor type capacitors installed on four-pole wood structures, fused in groups of 180 kva. and connected to the 2,400-volt substation bus.

Company B — Covers installation of 15,090 kva. of shunt capacitors during 1941 and 1942. Program discussed in detail later in paper.

Company C — The 1942 program covers installation of 10,500 kva. at 3-phase load centers to correct for average kvar. requirements during 1942 winter peak. "Durations were made depending upon distance of loads from source of reactive generation, overloading of feeders and substation equipment, necessity of raising voltage level at particular points, etc."

Company D—1,170 kva. in service and 225 kva. additional for 1942, located at feeder load centers. Correction is made to unity power factor at peak load when voltage regulators cannot maintain proper level. Regulators are then compensated 1 or 2% below base voltage setting on the contact making voltmeter to give correct voltage at load center at light load. Capacitors are pole mounted in 3-phase banks with maximum of nine 15-kva. units per pole. This company reports the following operating experiences:



(a) One case of severe telephone interference from harmonics due to capacitors was corrected by dividing the installation into two banks, one located a mile closer and the other a mile farther from substation.

(b) Have found it necessary to abandon 720-cycle carrier current control of water heater load on feeders with capacitors due to low reactance of capacitors to 720 cycles because sufficient 720-cycle voltage could not be obtained at the controllers.

(c) An improperly rewound motor in a large pumping plant put harmonic voltage on one feeder that paralleled a telephone toll circuit which resulted in severe telephone interference. A bank of capacitors completely eliminated the trouble by providing a low impedance path for the harmonic current.

Company E—At present there are two banks of 720-kva. and 360-kva. located at service entrances to industrial customers. Installations include oil circuit breakers with trip coils, discharge reactors, fuses, etc., as provided by manufacturer. No trouble of consequence has been experienced. The 720-kva. bank relieved overloaded generators and deferred additional generation; also reduced voltage drop and afforded better service to the customer. The 360-kva. installation gave the same incidental benefits and was installed by customer due to power factor provision in tariff.

Company F — Present capacitor installations total 225 kva. and 1942 program covers 405 kva. additional. Capacitors are pole mounted and fused. Several capacitors have short-circuited due to leaky lead bushing gaskets which permitted moisture to enter.

Company G — Present capacitor installations total 300 kva. using spare indoor units from a series capacitor mounted in outdoor housings. Some units failed in original installation due to inadequate ventilation. The condition was corrected by larger housing and more ventilation. The use of capacitors has delayed the need of revising the primary system on a city feeder and of advancing the feed point or raising voltage on rural lines.

Company H—Present installation includes two 90-kva. banks on gold dredges to improve power factor and avoid penalty. The fuse protection recommended by manufacturer appears to be too critical, resulting in many blown fuses with relatively minor voltage disturbances.

Installations Reported in Table II

Company I — First installation, 3-phase unit on 11-kv. line, successful in

Table I—Tabulation of Reasons for Installing Shunt Capacitors as Determined from Answers to Questionnaire

Reason for Capacitors	*Total Kva. in Order of Preference (1)	(2)	(3)	(4)	(5)	(6)
a. To meet system reactive requirements because existing sources of reactive are loaded						
b. To release generator capacity by reducing reactive load on machines	25,770	21,080	—	—	—	—
c. To improve voltage level on primary feeders and thereby increase feeder capacity and extend the effective range of feeder voltage regulators	20,000	25,770	1,080	—	—	—
d. To improve voltage level on main and subtransmission system	1,695	625	—	1,080	35,090	10,500
e. To increase substation equipment current carrying capacity where heating is the limiting factor	1,705	—	20,000	25,590	—	—
f. To release generating capacity by decreasing current in transformers and lines so that both the I^2R losses and I^2X requirements for the system will be reduced	—	1,395	180	—	11,580	35,090
	—	—	25,590	20,000	—	1,080

*NOTE:—Total kva. includes both installed and 1942 additions for the eight companies reporting shunt capacitors This does not cover all of the shunt capacitors in the Northwest area..

Table II—Tabulation of Amounts and Reasons for Installing Series Capacitors

Company	Series Capacitor Kva. Now In	Series Capacitor Kva. Planned 1942	Circuit Voltage	Type of Load Served
I	180	0	11 kv. and 4 kv.	Dredge and sawmill
G	160	0	20 kv.	Fluctuating
C	5	125	2.4 kv.	Fluctuating motor
B	360	0	24 kv.	Fluctuating sawmill
E	0	540	—	Fluctuating sawmill

correcting voltage changes caused by gold mining dredge. In operation for two years. Second installation, 3-phase unit on 4,000-volt line, partially successful in correcting voltage fluctuations of combined town and sawmill load. Capacitors removed and 66-kv. substation installed to handle sawmill load only. Capacitors now installed on similar 4,000-volt line with smaller sawmill and are successful.

Company G — First installation. 3-phase unit of 480 kva. installed on 11-kv. line gave trouble due to instability. Later, line voltage increased to 20 kv. and capacitor decreased to 160 kva. gave satisfactory operation. Same capacitor later moved to another 20-kv. line of similar characteristics and has been in successful operation for about four years.

Company C—First installation, 5-kva. installed for fluctuating motor load on long rural feeder. Protected by series relay to short circuit condenser on overload and street lighting cutouts to bypass surges. No trouble encountered and operation very satisfactory. Plans for 1942 cover 125 kva. of new series capacitor installations.

Company B — Only installation was 360 kva. installed in 24-kv. line serving combined town and sawmill loads. Gave satisfactory operation for about four years. Area is now served by 57/24-kv., 3,000-kva. transformer close to load. Load is too great for series capacitor so that it is now out of service. Originally capacitor was fed through a 57/24-kv., 1,500-kva. transformer located about 16 miles away. When 1,500-kva. transformer capacity was increased to 3,000 kva. and the capacitor was operating at close to full load, the decrease in reactance caused by the increased transformer capacity made the capacitor unstable due to over-compensation making it advisable to build the 57-kv. line into the load area. The series capacitor did a fine job of correcting for voltage fluctuations and regulation and also had the very desirable characteristic of correcting for power factor in proportion to the square of the load current. In this respect, it is a better power factor correction than the shunt capacitor which corrects in proportion to the square of the voltage.

Company E — No series capacitors are installed to date, but a 540-kva. installation is proposed primarily to reduce flicker caused by sawmill at end of long line, but also expect improvement in voltage regulation.

PGE Shunt Capacitor Program

After a study showed the need of additional reactive supply over the system at large, the next step was to determine how much and where. The how much was based on the load forecast of 1941-2 with the assumption that reactive requirements would increase in almost the same proportion as the load. The how much was set at 15,090 kva. of shunt capacitors of the 15-kva. size for outdoor use.

The location was determined from the analysis of many typical feeder graphic charts of voltage, kw., and power factor from which the kvar. loading was determined for the 1940 peak load period. It was found that the minimum reactive requirements for any feeder were about proportional to the total connected transformer capacity and since the 15,090 kva. was enough to correct for the minimum kvar. loadings the first allocation to each feeder was based on connected transformer capacity. For reasons illustrated in the problem of Fig. 1, it was found desirable to make some adjustments in the locations, but in general the correction is installed on the basis noted. Capacitors were installed only on feeders with voltage regulators, so that capacitor would operate within prescribed limits of voltage.

After allocating the amount for each feeder, the distribution of this on the feeder was based on detailed study of a number of typical feeders. In general, they are located at or close to 3-phase load centers on the feeders. In a few cases, they are at load centers on single-phase branches. Due to constantly changing load conditions, the choice of location on a particular feeder is not critical within reasonable limits, so that the line department was free to choose a good pole offering easy installation and maintenance.

The engineering department prepared and issued an instruction book for "Outdoor Shunt Capacitors" covering the procedure for installing, testing and operating shunt capacitors. These books are in the hands of line crews and all others concerned with these phases of the capacitor program.

The capacitor installations are not completed as yet, but should be in a few months. The service record of those in service is too short to offer any data based on experience other than to note that there have been no reports of trouble and they do give the desired correction and voltage boost, so that a resetting of the line drop compensators at the regulators is usually desirable

Test Data for Power Feeders

Due to lack of time, we have made no comprehensive tests to determine the effect of capacitors on our system; however, we know the benefits are there. The one exception was a test and analysis of the benefits to one of our 2,400-volt, three-phase power primaries fed from Station "E", which is a good example of the case where the benefit of boosting voltage and reducing kvar. load with capacitors may be justified on the basis of the feeder alone without giving weight to other system benefits.

In brief, this 200-amp. Hoyt Street feeder was loaded to capacity on the basis of current and voltage drop. The power factor was 73% at peak load. The installation of two capacitor banks, one 135 kva. located 1.1 miles from substation and one 180 kva. 0.4 mile farther out brought this power factor up to 93% at peak. From tests made of cutting capacitors in and out, it was found that with 635 kw. input at station end, the current was reduced from 205 to 160 amp. The voltage boost from the bus to the first capacitor bank was 5% and to the second bank was 6%. The power loss was reduced by 15 kw. and the 315 kva. rated capacity reduced the reactive load at the bus by 345 kvar. If the comparison was made on the basis of delivered power being equal instead of input power, the improvement would be still greater in regard to reduction of current and losses.

To complete the story of the Hoyt feeder, the distribution engineers are busy making use of its new capacity by adding more load to it.

Application to High Power Factor Loads

Since no complete test data were available on our residential primaries to show the benefits of capacitors, a computed example is given for the purpose of illustrating certain points which we considered to be important in determining where capacitors should be installed.

Fig. 1 shows the one line diagram and gives data fundamental to the problem. Table III gives a summary of the results of the computations. On Fig. 1 it shows that at peak load 425 kw. were delivered to each of six single-phase load centers at 2,400 volts and 96.5% power factor for each case under study. Also, the 11-kv. generator bus was

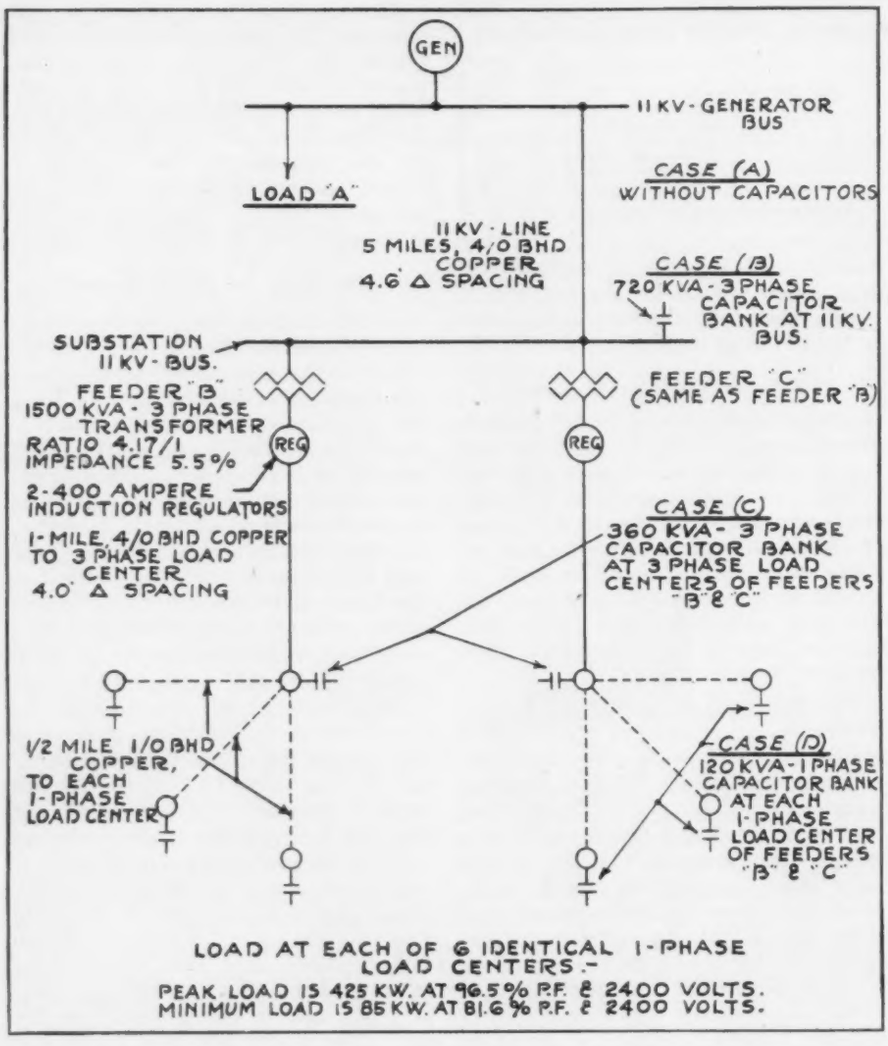

GEN
11 KV-GENERATOR BUS
LOAD "A"
CASE (A)
WITHOUT CAPACITORS
11 KV-LINE
5 MILES, 4/0 BHD COPPER
4.6' Δ SPACING
CASE (B)
720 KVA-3 PHASE CAPACITOR BANK AT 11 KV. BUS.
SUBSTATION 11 KV-BUS.
FEEDER "B"
1500 KVA-3 PHASE TRANSFORMER
RATIO 4.17/1
IMPEDANCE 5.5%
2-400 AMPERE INDUCTION REGULATORS
REG
FEEDER "C" (SAME AS FEEDER "B")
REG
1-MILE 4/0 BHD COPPER TO 3 PHASE LOAD CENTER
4.0' Δ SPACING
CASE (C)
360 KVA-3 PHASE CAPACITOR BANK AT 3 PHASE LOAD CENTERS OF FEEDERS "B" & "C"
1/2 MILE 1/0 BHD COPPER, TO EACH 1-PHASE LOAD CENTER
CASE (D)
120 KVA-1 PHASE CAPACITOR BANK AT EACH 1-PHASE LOAD CENTER OF FEEDERS "B" & "C"
LOAD AT EACH OF 6 IDENTICAL 1-PHASE LOAD CENTERS:-
PEAK LOAD IS 425 KW. AT 96.5% P.F. & 2400 VOLTS.
MINIMUM LOAD IS 85 KW. AT 81.6% P.F. & 2400 VOLTS.

Fig. 1—Physical data for problem illustrating the application of capacitors to high power factor loads

held at 11,600 volts at peak load for each case. This then gave the same basis for comparing the results of the computations for the four cases considered which were: (a) no capacitors; (b) 720 kva. at 11-kv. bus of distribution substation; (c) 360 kva. at 3-phase load center of each of the two 2,400-volt primaries, total 720 kva.; (d) 120 kva. at each of six single-phase load centers of the two 2,400-volt primaries, total 720 kva.

The results of Table III illustrate, in a general way, the following significant points:

1. The installation of capacitors to correct for low power factor loads electrically near to generation, or source of reactive, usually will not yield as great overall benefits to the system as the installation of the same amount distributed at high power factor loads electrically remote to generation, or source of reactive.

For example, referring to Fig. 1, if load "A" which is electrically near generation, was tested and found to be 3,027 kw. and 2,043 kvar. (82.8% power factor) and loads on feeders "B" and "C" were checked and found to total only 2,550 kw. and 690 kvar. (96.5% power factor), it would be easy to be misled into applying the most of the power factor correction to load "A" when actually an analysis will show much greater benefits may be obtained by placing the capacitors at the high power factor load centers of feeders "B" and "C".

2. Capacitors located at load centers on feeders show greater benefits than if they are located at a substation bus. However, there may be cases where it is desirable to switch capacitors on and off to suit system load and voltage conditions to perform the same functions as a synchronous condenser and then it would be necessary to locate them at a bus where this could be done, or install voltage controlled switching equipment for the individual capacitor banks.

3. It is important that capacitors be installed at points where voltage is maintained at rated voltage or above under peak load conditions so as to obtain the rated or better kvar. output from them. Case (b) emphasizes this point where 720 kva. at rated voltage of 12,470 volts has an effective capacity of only 550 kva. when operated at 10,900 volts. The effective capacity is proportional to the square of the voltage applied.

In case (c) with capacitors at the 3-phase load centers, the 720 kva. has an effective capacity of 806 kva. at peak load and 744 kva. at minimum load.

In case (d) with capacitors at single-phase load centers, the voltage is held at 2,400 volts by the regulators so that the effective capacity is equal to the rated capacity at peak and minimum load.

In comparing cases (c) and (d), it should be noted that the over-all benefits are about the same for this particular problem, which indicates that the location which gives the greater effective capacity from the capacitors may not give greater benefits than capacitors operating at lower voltage nearer to the reactive load to be served.

Most capacitor problems are solved by assuming rated output at nominal voltages and usually that is good enough. However, the writer is of the opinion that to get the "feel" of what capacitors will do on typical feeders on a system, it is desirable to calculate in detail the effect of capacitors at the various locations being considered. If, in this problem, rated output at nominal voltages had been used, the location at the single-phase load centers would have been indicated as being considerably better than at the three-phase load centers and even the location of capacitors at the substation bus would have looked fairly good. On the basis of the accurate computations, the capacitors would undoubtedly be located at the three-phase load centers because the full benefits are obtained at less cost than at the single-phase load centers.

4. Unless capacitors are to be disconnected from the circuit at light load, they should be located where the voltage is controlled by feeder regulators, tap-changing transformers, synchronous condensers or generator voltage. As an exaggerated case to illustrate the point, it will be assumed that in case (d) with capacitors at the single-phase load centers of the feeders, the voltage at the generator bus was held to 11,600 volts at peak load and minimum load and that the transformer taps at the substation were set to deliver 2,400 volts at the single-phase load centers at peak load with the feeder regulators out of service. In this case, the voltage at minimum load would be 2,980 volts at the capacitors and the 720 kva. of rated capacity would jump to 1.110 kva., which is 54% above rating. If feeder regulators are to be removed from serv-

ice at light load for repair, it may be necessary to disconnect shunt capacitors from the circuit to protect both the capacitors and customers' equipment in cases where regulators are bucking well down.

5. Although the problem does not illustrate the point, if capacitors are installed too far out on feeders with small copper, the 24-hour losses may be increased without compensating benefits.

6. Another point of interest not covered in the problem is the one of system instability at light load due to capacitors. Peak load studies may easily indicate economic benefits which warrant the installation of so many capacitors that if they are all left on the system at light load, it would make generators, normally rated at 80 or 85% power factor, operate with such a low field excitation as to make them unstable.

Discussion

R. S. DANIELS, The California Oregon Power Co. (written) — Mr. Enns has presented very valuable information for the use of those who have installed or are contemplating the installation of capacitors.

He shows that of the 49,000 kva. in shunt capacitors in the Northwest, the majority are used to meet system reactive requirements and to release generator capacity.

Series capacitors have been used to a small extent to improve voltage and power factor on rapidly fluctuating loads such as sawmills and certain types of dredges. Series capacitors are often the best remedy that I know of for sudden voltage changes caused by sawmills and motors on electric shovels.

A test we made on a 250-hp. motor operating a band saw showed a light load of 40 kw. and a maximum load of 375 kw. Once every 10 to 15 sec. the load increased from 40 kw. to 375 kw. in 5 sec., and immediately fell again to 40 kw. also in about 5 sec. The maximum 15-min. demand of this motor was 144 kw. The 15-min. demand for the entire plant was 600 kw., but the momentary demand as recorded on a curve drawing wattmeter was 1,100 kw. A series capacitor is able to respond instantly to such momentary loads, while a regulator cannot.

In locating shunt capacitors the article shows that each feeder has its own problems and emphasis is placed on the necessity of studying all the possibilities before deciding.

The study presented of the capacitor program of the Portland General Electric Co. is very helpful This program covers over 15,000 kva. in capacitors, mostly to be located near the 3-phase load centers. An interesting point is the fact that the capacitors as finally located are to be installed only on feeders having voltage regulators. This avoids the danger of too high voltage at light load.

The use of both shunt and series capacitors is bound to increase since they provide a ready means for (1) reducing line losses; (2) releasing generator and transformer capacity; (3) boosting and regulating voltage, and (4) improving power factor.

O. L. LEFEVER — We have ordered 10,000 kva. of capacitors and are putting them in this year. We made a study of the output of the substation and are prorating the kva. We are putting them out near the load on poles close to the transformer. We are putting them in banks of 45 kva., 90 kva., and 180 kva. with 20-amp. fuses, 40-amp. fuses, and 80-amp. fuses respectively.

Steel vs. Copper For Conductors

Informal Discussion

R. J. DAVIDSON, chairman of the Transmission & Distribution Committee, raised the question for informal discussion of the use of steel instead of copper conductors, calling on a number of company representatives for their experiences or opinions.

D. F. MISZ—We made some tests loading No. 9 iron telephone wire. It heated readily under load and we are not satisfied with the results of these tests. We have not used iron in any urban territory.

C. D. RANEY—In some cases the WPB has turned down applications for extensions using copper, but have said they would permit them if we would use steel, so we must consider using steel.

JOHN BANKUS—We have used some steel on rural lines and we may have to use some in urban construction. In some cases, we have been told to resubmit applications for extensions on the basis of using steel not larger than No. 6. We have made some tests on this conductor at voltages 2,400 to 7,200.

Table III—Tabulation Showing Relative Effect of Capacitors Located at 11-kv. Bus, 3-phase Load Centers, and Single phase Load Centers for Problem of Fig. 1.

	(a) Without Capacitors		(b) Capacitors at 11-kv. Bus		(c) Capacitors at 3-phase Load Centers		(d) Capacitors at 1-phase Load Centers	
	Peak Load	Minimum Load	Peak Load	Minimum Load	Peak Load	Minimum Load	Peak Load	Minimum Load
Capacitors—rated capacity	0	0	720 at 12.47 kv.	720 at 12.47 kv.	720 at 2.4 kv.	720 at 2.4 kv.	720 at 2.4 kv.	720 at 2.4 kv.
Capacitors—effective capacity	0	0	550 at 10.9 kv.	570 at 11.1 kv.	806 at 2.54 kv.	744 at 2.44 kv.	720 at 2.4 kv.	720 at 2.4 kv.
Voltage at generator bus	11,600	11,250	11,600	11,250	11,600	11,250	11,600	11,250
Voltage at single-phase load centers	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Substation transformer ratio	4.17/1	4.17/1	4.17/1	4.17/1	4.17/1	4.17/1	4.17/1	4.17/1
Substation regulators (approx.)	11% boost	3% buck	10% boost	4% buck	5% boost	10% buck	3% boost	11% buck
Substation kva. input at 11-kv.	3,360	927	3,360	927	3,010	576	3,020	575
Kw. input at generator bus	3,027	589	3,003	583	2,979	580	2,976	580
Kvar. input at generator bus	2,043	746	1,443	156	1,122	6	1,197	20
P. F. of input at generator bus	82.8%	61.8%	90.1%	96.5%	93.5%	100%	92.7%	100%
Total kw. at single phase load centers	2,550	510	2,550	510	2,550	510	2,550	510
Tot. kvar. at single phase load centers	690	360	690	360	690	360	690	360
P. F. at single phase load centers	96.5%	81.6%	96.5%	81.6%	96.5%	81.6%	96.5%	81.6%
Total kw. loss	477	79	453	73	429	70	426	70
Total kvar. loss	1,353	386	753	(204 gain)	432	(354 gain)	507	(340 gain)

(e) Summary of Relative Benefits of Capacitors at Different Locations

	Capacitors at 11-kv. Bus	Capacitors at 3-phase Load Centers	Capacitors at Single-phase Load Centers
Reduction in per cent boost	1%	6%	8%
Reduction in kva. load at generator	10%	15%	14%
Reduction in kva. load at substation	0%	10.8%	10.5%
Reduction in kw. load at generator	24 kw.	48 kw.	51 kw.

A. C. KELM—I do not think the distinction should be made as between urban and rural extensions in this matter of whether or not we should use steel conductors. The question is one of current-carrying capacity. In normal times we wouldn't use steel because we would expect the load we originally put on this line to grow; but now, under existing conditions, we might use it in certain cases. In each case, you have to calculate your load and voltage drop on a steel conductor line and decide whether or not you can be satisfied with the results indicated by this calculation.

DAVIDSON—We might find it necessary to put in the steel in certain instances now, realizing that it would give substandard service but intending to replace the conductors with copper after the emergency.

S. C. LINDSAY—We installed a good deal of steel in the last world war. We had to change it out in 9 to 12 years. It has a large reactance and it deteriorates in this climate. If you get the double galvanized, it will give you longer service. The single galvanized won't last even 10 years, but you may get 15 years with the double.

H. M. JONES—We submited applications for 19 extensions to irrigation customers who had bought pumps and were ready to go. We got approval on steel but not for copper.

DAVIDSON—It is not so much a case of whether we like it as it is whether we are going to render such service as we can with the facilities that we are permitted to use. Temperature rise of the conductor is the all important factor. Undoubtedly we will be willing to use steel within its limitations.

Code Committee*

War Enforcement Of the N. E. C.

By S. B. CLARK
Northwestern Electric Co.

This paper was presented before the Engineering and Operating Section and appeared in May ELECTRICAL WEST, p. 41.

Discussion

S. B. CLARK—It is up to the utilities to help the inspectors to get the latest rulings and apply them.

F. D. WEBER—The Electrical Committee has effected a procedure whereby the executive committee of that group is to pass on substitute materials or changes in the code without resorting to a letter ballot of the whole committee.

Fire Underwriters also are getting out bulletins on substitutes. These are to be permitted for the duration and we ought to expect to go back some day to the standards we are now finding it necessary to revise.

With reference to the neutral conductor in a wiring system, it is not to be bare neutral. It will be covered by a braid, but not with rubber. It also appears that we are going to see cambric insulation on regular conductors.

A great many items are going to be restricted. It will be difficult to keep up to date on new regulations. Almost every day we get some exceptions from Underwriters Laboratories.

CLARK—The proposal has been made that cable assemblies be made up with weatherproof instead of rubber-covered wire.

PAUL P. ASHWORTH—I find that fuse plugs are getting very scarce. What are we going to do for fuse protection if they restrict the manufacture of these?

*S. B. Clark, Northwestern Electric Co., Chairman. M. T. Crawford, Puget Sound Power & Light Co., Vice-chairman. B. C. Electric Railway Co., W. G. Murrin; The California Oregon Power Co., S. M. Bullis; Eastern Oregon Light & Power Co., Gene Walker; Idaho Power Co., H. M. Jones; The Montana Power Co., M. E. Buck; Mountain States Power Co., Geo. McClellan; Pacific Power & Light Co., J. E. Yates; Portland General Electric Co., F. H. Murphy; Preston Shaffer Milling Co., M. L. Watts; Puget Sound Power & Light Co., R. A. Walker; Telluride Power Co., Paul P. Ashworth; Tobacco River Power Co., H. McCullough; Uintah Power & Light Co., V. A. Bair; Utah Power & Light Co., J. H. Stayner; The Washington Water Power Co., L. R. Gamble; West Coast Power Co., Henry Berk; General Electric Co., L. R. Elder; Oregon Insurance Rating Bureau, F. D. Weber; Portland Chief Electrical Inspector, L. W. Going; Westinghouse Electric & Manufacturing Co., V. B. Wilfley.

Wartime Operation—A Symposium

Plant Protection In California*

By A. W. COPLEY
Westinghouse Electric & Manufacturing Co.

CALIFORNIA operating companies are trying to take all reasonable precautions for insuring continuity of service, keeping in mind that it is not possible to obtain absolutely invulnerable protection and foolish to go to the other extreme of doing nothing.

Property is being guarded as far as possible by the use of company guards. In many cases, operators have been given guard duties in addition to their operating work, but in such cases the guard duty has been made supreme and the operating duty secondary. Properties have been fenced and admission to these properties can be obtained only by passes which are very carefully controlled.

Dams are floodlighted and guarded. Fuel tanks at steam power houses, which have in the past been protected by concrete or brick walls, now have these walls surrounded by an earth embankment.

Power houses and substations are fenced and the fences are so lighted that the apparatus enclosed is not easily seen. Glass has been replaced wherever there is danger to personnel from its breakage. In many cases windows have been filled with concrete and skylights have been removed, and filled with concrete. Particular attention has been paid to battery and communication rooms in the concreting of windows and skylights. Artificial ventilation has been required.

* Summary of Extemporaneous Remarks

Many important transformer banks have been surrounded by revetments which protect from flying fragments, but, of course give no protection from a direct hit from above. It has been necessary to allow for ventilation so that overheating does not occur when the transformers are thus enclosed. Low level oil alarms are generally used. The protection of bushings is considered impractical.

Spare equipment is stored indoors as far as possible at strategic points away from the apparatus for which it is to be used. It is considered more practicable to have a liberal supply of spare equipment and emergency materials rather than to attempt to give full protection to the smaller pieces of equipment. The repair of damage to transmission or distribution lines is provided for by stocks of poles and insulators spread over the district in which they might be used.

In new construction wood is being substituted for steel in many substations.

It is expected that although the precautions which have been taken will not entirely protect the properties and the service from bombs or from sabotage, they will make the repair of damage and the restoration of service comparatively simple. Training of personnel has been carried out with this same thought in mind.

What the Industry Is Doing To Help*

By A. B. CAMPBELL
Edison Electric Institute

IN THIS MATTER of helping to win the war, the light and power industry is cooperating 100 per cent. We find excellent cooperation and coordination with the OCD, the Army, the FPC, the FBI, and other governmental agencies coming into contact with the industry. What we mainly need now apparently is full coordination within the government agencies since it is sometimes physically impossible to comply with the regulations issued by all of them.

Mr. Cowgill's story of coordinated operation in the Pacific Northwest is an excellent example of how the utility industry is contributing to the war effort. This has put added capacity to work without investment in generation equipment which would require critical material and man-hours that might be needed elsewhere. Mr. Snow's presentation of the wartime mutual assistance program indicates how equipment and manpower can be conserved and at the same time add strength to the continuity of service which is so important to the war effort.

From the best information we can gather and marshalling the most reliable judgment, we believe this will not be a short war. It may last from three to six years.

With reference to emergency maintenance and repairs, an interesting story came out of the bombing and shelling of the Shanghai properties. The superintendent there kept records, which may now be valuable to other companies whose properties may be bombed. These records showed the extent of damage to the different parts of the property. It indicated a great ingenuity in making repairs. Crosby clamps with jumpers soldered on proved to be very valuable for quick repairs. If, for instance, a 7-strand conductor was damaged so that all but two strands were shot away, these clamps could be applied one on each side of the damage and that conductor was ready for full service again.

About 100,000 kva. of transformer capacity was put out of service, but less than .66% had to be scrapped. It cost 40c per kva. to repair the damage, three quarters of which was in the loss of transil oil. An amazing fact was there were no fatalities and no lost-time accidents.

The Bureau of Standards has been asked to form a committee to get out a specification for blackouts, star-light, dim out, etc. The power companies will be represented on this committee.

With reference to contact with the transportation and communication people, our work has been hampered by loss of personnel, but this joint work is going on in matters pertaining to the war emergency.

The national convention of the EEI has been cancelled, but the engineering committee meetings will be held as usual at the Edgewater Beach Hotel, Chicago. The Electrical Equipment Committee is working on voltage stabilization and motor starting currents. The Transmission and Distribution Committee is about ready to issue a report on cable operation, and an a.c. networks report is expected to be out this week. All of these will be discussed in Chicago.

A joint EEI and NEMA street lighting committee is also practically ready to report. The Accident Prevention Committee is studying four or five subjects connected with the emergency. The EEI has made a study of the wages and hours situation, inventories, appraisals, cost accounting. The EEI and the gas association have a publication on methods of appraising the life of different classes of property.

G. W. Kellogg, president of the EEI, has been called to Washington for a conference on the rationing of power. They may set a ceiling on the new business a power company may accept. They may also set up shortage areas. Possible shortages should be off-set by using all the capacity available, pooling the private and public plant capacities.

A rise of 4,600,000 kw. in peak is expected this December, though this may be lowered somewhat by the displacement of civilian business. The Pittsburgh area thinks it might have to go to rationing soon, but most places expect to get by.

Salvage Vital To War Effort

By GEORGE SUTHERLAND
Industrial Salvage Section, WPB

IN 1941, production of all products in the United States was increased about 50%, because in that year we were in the defense era. Twenty-one per cent of production went to war materials. In 1942 production will be doubled and 53 per cent of the production will go into war materials. That means that there is practically nothing left for anything except war production and that conservation is a paramount issue.

Last summer the Office of Production Management, as it was then known, recognized this necessity for the conservation of materials vital to the defense program and set up an official Bureau of Industrial Conservation. Obviously, materials used over again would save not only raw materials but also the labor and production facilities necessary to produce them. It was also apparent that scrap materials, ferrous and non-ferrous metals, paper, rags, and rubber would become an important element in the production of guns, ammunition, tanks, ships and airplanes.

Statistics Point Need

The importance of scrap materials became more obvious as production statistics became available. During the year 1941, 50 per cent of all the steel produced came from scrap, one-third of the copper, 33 per cent of the zinc, one-fifth of the lead and one-sixth of the rubber. This was during a year when only 21 per cent of our total production was for defense products. It is an impressive picture of the value of scrap in industry.

Let me picture it in another way. In

* Summary of extemporaneous remarks.

the United States, there are 125,000 junk men and 14,000 dealers at work on the job of collecting and preparing scrap. In one year they accumulated 70,000,000 lbs. of scrap aluminum which is sufficient to build 5,300 bombers. They collected and turned back into production enough scrap rubber to make 186,000 tons of reclaimed rubber, the equivalent of 12,000,000 tires. Incidentally, one 28-ton tank requires the rubber equivalent of 125 automobile tires. They returned to circulation 26,000 tons of tin, enough to produce the babbit metal, bronze and brass needed for 150,000 airplane engines.

But used materials are not the only ones that can be conserved. New materials can also be saved through simplification at the source, by reducing the number of designs, shapes and colors, and by revising complicated specifications. These needs were recognized and coincidentally it became apparent that substitutions would be necessary when one kind of material became scarce because of increased use in the defense program.

Program Objectives

This was the rather comprehensive picture of the needs for conservation back in 1941 when the Bureau of Industrial Conservation was organized and its objectives followed the outline of the needs.

These objectives are:

1. Assist industry to conserve new materials suggesting simplification of design and reduction of number of types, sizes and colors of manufactured units by revising specifications to conserve materials and by offering substitutions for materials vital to war.

2. Advise industry how to make the best use of usable secondhand materials by the circulation of information about practical methods of reclamation.

3. Develop salvage programs for waste materials in order to secure a larger, faster flow of normal and dormant scrap from industry into the regularly established reclamation and conversion channels to supplement the supply of materials needed for an all-out armament program.

4. Advise industry how best and most expeditiously to prepare and transport scrap for absorption by industry.

To accomplish these objectives the bureau was organized with five sections:

1. Specifications.
2. Simplification.
3. Substitutions.
4. General Salvage.
5. Industrial Salvage.

More recently two other sections have been added:

1. Automobile graveyards.
2. Special projects.

The first three sections are composed of engineers and material specialists from the manufacturing fields who "strip tease" specifications, work with the manufacturers in an effort to reduce the number of styles, types, sizes, colors, etc., of the finished product, and who conduct research studies in order to find substitute materials for those that have become scarce either through the requirements of the war program or because the source of supply has been shut off by the fortunes of war.

Tin Substitutes

Tin is an excellent example of the kind of work the Substitutions Section is doing. Sixty-seven per cent of the tin supply of the world came from Malaya Peninsula and the East Indies. That source has been shut off and utilities will no longer be permitted to use 40% tin, and 60% lead in the solder on their cable joints. An order from the WPB will limit the amount of tin permitted for any solder to a value considerably less than 40%. Three substitutes have been proposed. One is 2½% silver and 97½% lead; the other is 1½% silver, 5% bismuth, 1% antimony, 15% tin and 77½% lead. The third is 1½% silver, 3% bismuth, 20% tin, ½% antimony and 75% lead. The workability qualities of the substitutes are not always as good as the 40/60 solder but the cost is about the same. Using 15% in all solders instead of 40%, will save 5,000 tons of tin annually.

Salvage Group Function

The General Salvage group is entirely separate and distinct from the Industrial and is doing a splendid job working through the committees of civilian defense, the housewives, schoolchildren, Boy Scouts, etc., throughout the country.

To the Industrial Salvage Section has been assigned the job of advising industry on salvage and reclamation problems and to expedite the flow of both normal and dormant scrap through normal channels into the flow of materials urgently needed for war. To do this job we have in Washington a small staff of material specialists and men taken from special fields of industry. In nine large industrial cities branch offices have been set up with qualified field men to follow up the work started in Washington and to initiate salvage programs in all the industries in their respective areas.

The work is done by correspondence and the personal appearance of our staff members before trade association meetings and small informal groups of industrial top executives. Each group is asked to set up a steering committee which in turn will organize other committees to work in individual industries or individual plants. In the past three months, 170 trade associations have been enlisted in the program, reaching approximately 30,000 industrial plants.

In each case, the same fundamental plan has been followed with variations in detail to suit local conditions. This plan is familiar to you all—I hope. We tried to reach all executives in all the utilities with our message. Let me repeat it for emphasis. It is short and simple:

1. Put some one individual in charge of salvage in every department of your business and give him authority to act now.

2. Devise an effective method of bringing the message of conservation to *all* of your employees.

3. Build into your program a plan to keep it alive. Don't let initial enthusiam die.

4. Report periodically the amount of scrap materials you have released, stating quantity, kind and name of dealer to whom sold.

Reports Important

This last request is not just to add another report in order to make them reach from Washington to San Francisco when placed end to end. It has two purposes: (1) the quantities are a measure of the progress of the program; and (2) the name of the dealer enables us to follow up the sale to insure that the scrap keeps moving after it has been released.

To evaluate the accomplishments of our program in tonnages is difficult, in spite of our polite requests for reports. Not all of the companies participating have reported and it is impossible to differentiate the normal scrap releases from those due directly to the scrap speed-up effort. But we do have a large number of individual case histories which indicate that our work is well worth while.

Many companies have written to the effect that while they had a thorough housecleaning last December, they have undertaken another at our request and have been surprised to find that it produced from 30 tons of steel and iron scrap in one case to 150 tons in another. Likewise the appeal to seek out and review the relative usefulness of obsolete equipment has brought in many cheering reports of increased tons of scrap metals.

One utility company in the East is

scrapping an old gas plant and sold 897 tons of steel and iron in February with 2,000 tons more to go. A steel mill in Pittsburgh found 2,000 tons of scrap iron and steel in its own backyard. A paper mill in Pennsylvania located 1,800 tons of ferrous metals in the first week of its intensified drive. A coal mine in West Virginia put on a special campaign and sent to the mills 20 carloads of scrap metals in three weeks.

However, there is still lots of work to do because scrap materials are urgently needed in the next few months to maintain the tremendous schedule of war production set up for industry. The program for 1942 calls for double the production of 1941 with 53% of it going into war requirements. Mr. Batt tells us that we will need 6,500,000 more tons of scrap steel and iron in 1942 than we produced in 1941—and that was 53,000,000 tons. Open hearth furnaces are being shut down each week because of lack of steel scrap.

We can help you in your conservation by giving you advice on your specifications and on substitutions for non-obtainable materials. Use the Bureau of Industrial Conservation facilities. We can help you on the reclamation of materials that come in from the field, although industry has done a pretty good job on salvage already. You can help us by expediting the flow of normal scrap through regular channels and particularly by making up your minds to scrap that obsolete equipment that has been kept around for years on the basis that it "may be useful someday."

Discussion

S. B. CLARK—With reference to wiping metal, the 30-70% ratio will be all right for some uses, but when you go below 38% tin, you do not make a non-corrosive solid electrical joint.

SUTHERLAND—The 1% antimony improves the density of the white metal.

PAUL P. ASHWORTH—We have found in our territory that the salvaging of materials from auto graveyards requires a lot of labor. Many parts have to be dismantled, wrecked, sorted and otherwise prepared for salvage. We are thinking of getting the boys in the high school shops to help on this work, giving them torches and sledge hammers.

There is a great deal of valuable material in automobiles, but it varies with different makes. If we could get from the manufacturer what parts of their cars are made of what metal, it would be a help.

SUTHERLAND—The "graveyard" section of the bureau will have representatives in various cities and they can be of assistance in this work.

(In answer to question with reference to a de-tinning mill on the Pacific Coast)—We are hampered in reclaiming tin from the fact that there are not many de-tinning mills and it is sometimes prohibitive to ship scrap tin long distances to what mills there are. I understand the American Smelting & Refining Co. is planning to build a Pacific Coast plant.

M. T. CRAWFORD—We have a salvage shop in Everett that was formerly a repair shop for interurban cars. Now we are using it to reclaim all manner of usable materials and apparatus. We straighten, splice and recondition wire; cut short pieces for tie-wire; strip weatherproof wire that is in bad condition for bare wire; straighten and regalvanize hardware and bolts; and do many other operations to make non-usable material into usable material. All districts are shipping their unusable material to this plant for reconditioning.

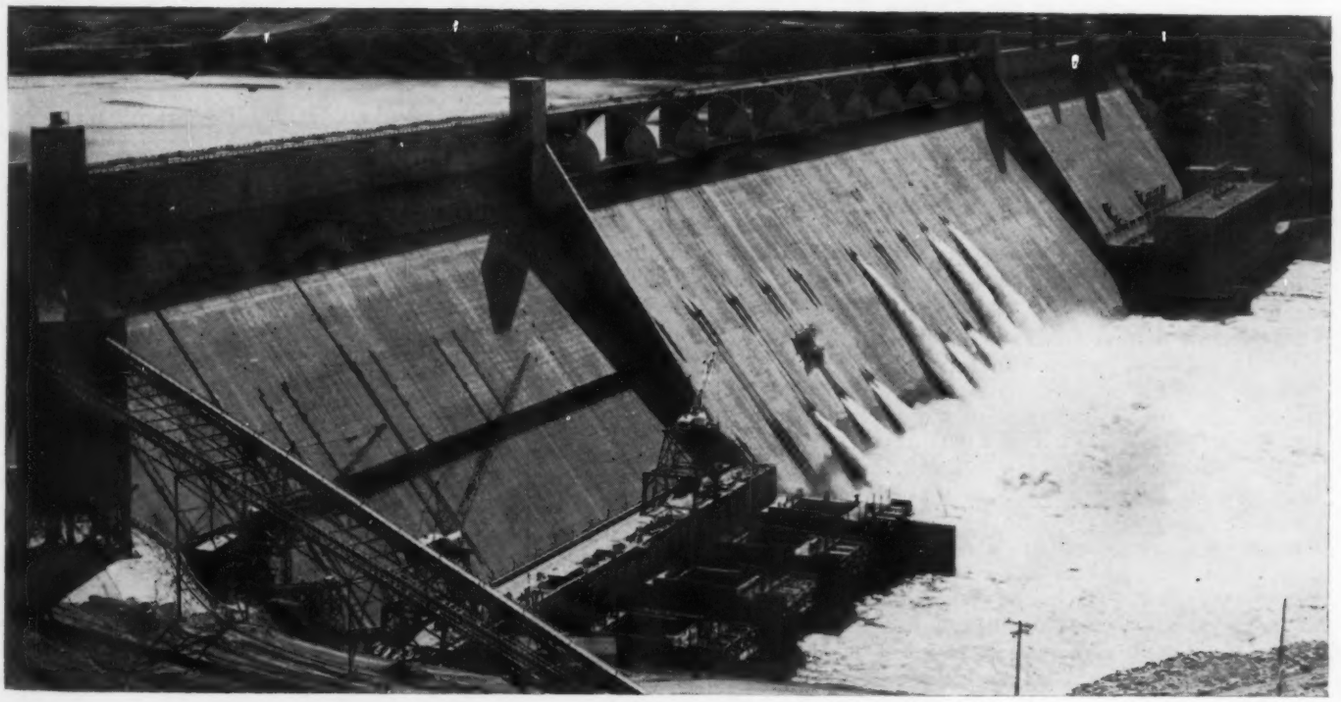
We are adapting our standards and practices to the conditions at hand. We are trying to use iron instead of copper, and are encouraging the types of distribution that will conserve materials. We have extended our 4-wire common neutral grid in Seattle, 1 primary and 3 secondaries, to the smaller cities, and are thus saving 1 wire throughout.

S. C. LINDSAY—Our line crews tend to create scrap by wasteful methods. Our foremen should be trained to watch this and keep the men from being wasteful.

SUTHERLAND (in answer to question)—It is legitimate to salvage for your own use whatever apparently unusable materials you have. Such practice will make it unnecessary for you to order new materials. I am referring to such items as cutting short pieces of wire into tie-wire, and when this is done, it is not scrap because it is usable.

We expect to get out a handbook which will tell about reclaiming materials.

LINDSAY (in answer to question)—Our salvage shop at Everett employs older men who are no longer fully effective as linemen and at other skilled crafts.



Priorities and the Price Freeze

Regulations increase in general although some amendments afford relief from unintended blankets

PRICE freezing began to jell, some limitation orders were screwed down a notch or so tighter, others loosened to allow a product or two not really intended to be quite so drastically clamped down upon a little leeway, but in general things grew tighter and more confusing for electrical dealers and contractors, as well as their suppliers and manufacturers, last month.

The main hiatus, though, was that wages went up despite the President's plea while the ceiling on prices for commodities and services, (whatever "services" means in the way of labor) came down. Caught in this squeeze, and with interpretations slow in coming, owners of businesses were plenty confused and somewhat discouraged.

Broken down into those orders, restrictions or limitations affecting first contractors, then retailers, then utilities, the month of May contained the following:

Construction and Wiring

Does labor come under the price freeze? This was still an undecided question at the end of May, although word from NECA in Washington said that OPA maximum price regulation applies to electrical contractors, effective July 1. Additional information was to be issued and possibly provisions made for increased labor rates where necessary.

Both wages for electrical workers, and *freight rates* have advanced since March, 1942. An amendment to price regulation 136, covering industrial machinery, permitted those who sell on an installed basis to calculate installation prices at March 1942 rates for field labor and *outbound* freight, although the price of machinery is to be based on Oct. 1, 1941 schedules. The effective date at first was set for May 18, but later amended to June 1. Still the question of labor charges to the customer despite the raise in wage rate to the contractor, was not settled.

Two incidents may have a bearing. Industry-wide wage agreements between the AFL building trades and the government for the duration were announced May 22, to take effect July 1. Wage adjustments are to be handled by a Federal board rather than individual companies. This may mean adjustments of price ceilings to include such stabilized wage rates when they are effected.

Although it was not certain whether contractors come under the provisions of OPA 136, it was pretty certain that motor dealers and service shops did, that their prices for rewinds, rebuilt motors, and shop service charges would all be under the regulation.

Rebuilt and guaranteed equipment has a maximum price of 85% of net price for new in Oct. 1941; other second hand equipment 55%. Rentals too were set at Oct. 1 prices. No terms or conditions, guaranties, maintenance clauses, discounts, trade-in allowances or rental credits in effect Oct. 1 could be discontinued. Records must be kept, and a report turned in by July 1 of all prices. Listed in the appendix as "machines and parts" were a long list of electrical equipment, including wiring devices and supplies, fuses, conduit fittings, metalic outlets and switchboxes and underfloor ducts.

Copper restrictions went still tighter. Under M-9-c to get copper for the rewinding of a motor for a war production plant an R-1-k ro better is now necessary effective May 7.

Construction, limited to $500 total by L-41, last month, was further limited by L-41-a, calling for the stopping, no matter in what state of completion, before June 6, of *any* construction costing $5,000 or more. It exempts only playgrounds for children of temporary nature, costing less than $5,000 total and authorized by WPB.

Authorized construction by the WPB is to be placarded, the card carrying the serial number of the project. Cards will be sent with the authorization papers. A nationwide construction survey to check up on L-41 violators was begun too, HOLC loaning 3,000 examiners to checkup for WPB.

P-19-a is an amendment restricting to a P-19 type of job supplies that will be physically incorporated in it, and will not allow any surplus for operating or maintenance.

Army and Navy jobs began to prohibit, in accord with the April 1 list of prohibited materials in construction, the use of rigid conduit, permitting electric metalic tubing and electro-galvanized. Armored cable and rubber insulation on a grounded conductor was prohibited and building wire limited to Type R.

Fluorescent lighting took it on the nose too during May. L-78 had previously ordered all production to end April 22 except for rated orders. An amendment was issued to permit completing of fixtures of 30 watts or less from materials already on hand. Under the first order no fluorescent fixture could be sold or delivered after June 1. The amendment allows unrestricted sale of small fixtures and of cold cathode (high voltage) equipment.

About May 11 came a hint that no more steel would be permitted used in fluorescent fixtures. And on May 22 a nationwide inventory of existing stocks of fluorescent fixtures was begun by WPB. The forms were to be mailed out before June 5, asking for complete list of completed fixtures, ballasts, starters. Purpose was to work out an allocation policy.

Financial assistance was offered contractors for handling of war production contracts or subcontracts by the Federal Reserve Bank under Executive Order 9112 by the President.

Dealers and Merchandise

Frozen already by previous orders, appliances were blanketed in under the general OPA price freezing order. The general price regulation order listed as requiring a posting of ceiling prices only the following: radios and phonographs, vacuum cleaners and carpet sweepers, refrigerators and iceboxes, washing machines, ranges, stoves, small appliances such as irons, toasters and lamp bulbs. A label, stating, "Ceiling Price $ " is required on these.

Service charges on appliances were also frozen, but not until July 1. Prices for such service must not exceed those in March.

Used refrigerators, to everyone's surprise, came under the OPA 139 order. Ceilings were very definitely set on "as is," "unreconditioned" and "reconditioned," and were generally under average going prices. Dealers were being cautioned by leaders in the industry not to make allowances for refrigerators, and to be cautious about making them on washers, ranges or other used appliances, over the Blue Book or Market Index figures. The prices under 139 were rolled back to February because OPA said used refrigerators increased unreasonably in March. A complete tabulation is given in OPA release PM-3187.

Surprise was contained in L-5-b, effective June 15, in which a dealer will

not be able to sell any refrigerators he did not himself have in stock before Feb. 14. Dealers who bought up stocks of dealers who went out of business will have to sell these before June 15.

Another L-5 order released low temperature equipment for frozen foods or quick freezing. *Commercial refrigeration*, however, was frozen May 15, under L-38, except for A-9 or better ratings, or emergency repair service parts under P-126. *Air conditioning* equipment came under the same ban. Until Aug. 15 army, navy or maritime commission orders for beer dispensers, etc, may be honored.

Electric ranges were frozen under L-23-b, on May 2. Gas ranges had previously been, under plumbing order L-79, but later amendment P-84 made possible purchase with a PD-1-a form sent to Washington, to replace a worn out range. Electric ranges were to be permitted sold to fill orders of A-1-k or higher. People not owning any range and needing one, could request purchase of an electric on a PD-1-a, however. No release of electric ranges from the freeze order was contemplated.

All cooking appliances, using all fuels, were put under limitation of manufacture by other L-23 orders, however, to conserve metals. Residential oil burners and coal stokers were also ordered out of production after May 31. Solid fuels, except wood, were put under the price ceiling too.

Electric water heaters, which had been blanketed under plumbing order L-79, and allowed sold under P-84 on request showing need on a PD-1-a form, evidently were still further opened up for sale late in the month by another amendment.

Sewing machines were likewise put under the limitations with production quotas reduced, and ordered stopped on June 15. Conversion of treadle type to electric is also barred.

Repairing, retrimming, recovering of lamp shades, according to an interpretation of L-33 governing portable electric lamps and shades, is okay as long as no new metal frames are used.

"*What every retailer should know about the General Maximum Price Regulation*" is a bulletin offered retailers by OPA, and announced May 15. Copies are to be sent to stores or may be had on application.

Deliveries Curtailed

Defense Transportation Orders No. 5 and 6, effective June 1, but issued May 9, hit everybody with trucks; common, contract and private carriers, and includes local deliveries as well as long haul. A vehicle is defined as "any rubber tired vehicle propelled or drawn by mechanical power or by horses." It prohibits special deliveries, call backs and more than one delivery on any one day. Mileage must be reduced, records kept, and loadings for both directions are prescribed. Joint delivery pools and plans must be submitted to ODT and the Dept. of Justice.

Utilities

Construction and maintenance vehicles are specifically exempted.

Materials in excess stocks of utilities are to be used in making electric extensions to housing projects, WPB notified them on May 19. No more authority to purchase materials for such purposes would be given. As part of the plan the WPB Power Branch received from electric utilities reports of their excess stocks of wire and other materials. Utilities must still make application to WPB to use their own stocks in this manner, however.

Although utility rates are specifically exempt from the Price Control Act, OPA apparently will not remain silent where increases are sought. In the case of a request for a rate increase by a telephone company this attitude was expressed.

Dimout Ordered

At the request of the 12th Naval District, orders were issued May 11 to dim out all lights visible from the sea from the Santa Maria River to the Oregon border of California. Street and highway lights visible from the sea were required shielded so that no visible light could be seen from the seaward side at night and that no light would be directed upward. Advertising signs, floodlighting, display lighting and amusement places were ordered darkened.

On May 22 the same orders were extended through the 11th district, to the Mexican border

Residential, commercial and industrial windows were ordered shielded by drapes or shades. Ordinary roller shades, venetian blinds or drapes were said to suffice.

Street and highway traffic was to be diverted inland wherever possible. Where not practical, vehicles were required to extinguish driving lights and move at a reduced speed with parking lights only. Other forms of light visible from the sea were prohibited except beacons, navigation and other authorized lights.

Power companies immediately began painting or otherwise shielding exposed surfaces of street lights visible from the sea. Purpose of the dimout was to reduce the danger to shipping occasioned by silhouetting of vessels against coastal lighting.

Frank Hansen has been appointed regional illuminating engineer for the Ninth Civilian Defense Region (embracing eight western states) of the Office of Civilian Defense. Hansen, director of the Western Institute of Light & Vision, has also been the regional vice president for the Illuminating Engineering Society in the Far West.

Although his home was in Los Angeles, his new headquarters are the OCD headquarters at 1355 Market St., San Francisco. He is working under former architect Wm. Pereira, assistant regional director in charge of property protection.

Make 'em Want it

War scarcity may do for home wiring what the promotional efforts of the industry over years have failed to do successfully — namely, make people want more of it. That perversity of human nature which allows complete indifference to a commodity or service when it is abundant, yet makes it exceedingly desirable when scarce, is found to be working upon consumers now in respect to home wiring.

This was the opinion expressed by Arthur E. Schanuel, the National Adequate Wiring Bureau's field representative, when asked what wiring promotion could be conducted during these times of materials scarcity. Schanuel made a tour of the West from Denver, beginning May 20 and including Salt Lake City May 22. San Francisco May 26, Fresno May 28, Los Angeles May 30 and will continue in June to San Diego June 2 and Phoenix, Ariz., June 8. Then to El Paso, Tex., June 10.

The NAWB's program for the duration is to provide builders of defense homes with wiring layouts so locating the limited number of outlets permitted as to give the occupants of the homes maximum and immediate service and convenience. However, such wiring systems are engineered to conserve maximum amount of copper by planning of runs and location of outlets. Wherever possible, provision is also made for future additions to the wiring system when materials are again available. Such additions would bring the installation up to adequacy standards.

Utilities in their programs are carrying informational service to customers, telling them how their wiring works, instructing them how to use appliances properly, save needless fuse blowouts and trouble calls. Interestingly, this information is building an appreciation for the wiring system which promises to create a demand for better wiring when the materials are again available after the war, said Schanuel.

LIGHT for DRAFTING

Fluorescent

Who

Drafting room, Bureau of Water Works & Supply, Dept. of Water & Power, 207 So. Broadway, Los Angeles. Designed by Illumination Unit, Bureau of Power & Light. Installed under supervision of E. L. Crocken, engineer in charge of building operation and maintenance.

The Need

Higher intensity to permit detail drafting with less eye strain. Existing illumination approximately 20 fc. of indirect lighting.

Conditions

Room height, 10 ft. 2 in. White ceiling, approximately 75% reflection factor. Light walls, approximately 50% reflection factor.

Installed

Seventy-three Hygrade HF-201 units, using four 3500° white fluorescent lamps; spacing 8 x 8 ft., mounting height 8 ft. 5 in. to bottom of fixture.

Results

After one month's service, foot-candle measurement, not including daylight, ranged from 55 at edge of the room to 78 at center. Minimum foot-candles in service exceed 50.

LIGHT for BEAUTY SALON

Fluorescent

Who

Western Hair Beauty Parlor, 819 W. Riverside Ave., Spokane; design by Lighting Service Bureau, Washington Water Power Co., L. V. Ross, illuminating engineer; Lee Fanning, specifications; Neil Mahar, commercial representative. Installed by Metallic Arts Studios, Spokane; wiring by Maxwell & Franks.

Conditions

Long narrow store, about 16 ft. ceiling, with mezzanine around both sides and back; individual booths underneath.

Installed

Three-phase, 4-wire system, with 208-volt tu-lamp ballasts. Two 360-watt, custom built plastic enclosed fluorescent ceiling units with 6 ballasts each, 36 ft. long; 61 30-watt custom built plastic enclosed fluorescent wall brackets and ceiling units for booths, each 3 ft. long. Two 180-watt custom built plastic enclosed units for under front balcony edges, each 18 ft. long. Four 120-watt indirect fluorescent troughs, with two parallel rows of lamps, 7½ ft. long, set on top of partition walls at rear of main floor and rear of balcony. Windows: 4 30-watt 302 Curtis directional reflector assemblies, 4 30-watt 337 Curtis distributing reflectors. Two of each in each window, recessed. White 3500° K lamps used.

EMEA *Dope Sheet* — *Edited by Howard C. Park*

EMEA of So. Calif.

Preventing Ball Bearing Failures

"Useful life" can be lengthened by observance of service fundamentals

Eighty to 90% of all ball bearing failures which occur before the bearings have attained their normal "life expectancy" may be prevented by the proper observance of service fundamentals.

This conclusion is attributed to a reputable ball bearing manufacturer after exhaustive study of the causes of ball bearing failures. While this opinion represents an average of the failures occurring under all conditions of operations encountered, it may be assumed that a large per cent of the failures occur even where bearing maintenance is provided.

This being the case, it would seem to be an indictment serious enough to require a review of ball bearing service fundamentals and some of the more common causes of *wasted bearing life.*

In the following discussion it will be assumed that the proper bearing, correct shaft and housing fits, spacers, lubricant, etc., were provided on the original installation. Any reference made to them may be construed as being the result of improper observance of service fundamentals.

Causes of Failure

1—Dirt
2—Improper lubrication
3—Misalignment (of bearing)
4—Overload
5—Excess thrust
6—Vibration
7—Oxidation
8—Electric arc

Dirt

Dirt is, by a large per cent, the greatest single contributor to the causes of ball bearing failure.

Any foreign matter which may enter the bearing, other than the proper lubricant necessary to lubricate the bearing, may be considered as *dirt.*

Under some operating conditions dirt will enter the bearing, even when the best types of seals are used. Such conditions can probably best be controlled by frequent service.

The greatest danger from dirt entering the bearing is during the period of servicing. Dirt may enter the bearing by:

1—Careless handling of bearing,
2—Dirty tools, bench, hands, etc.
3—Dirty cleaning fluid,
4—Dirty grease,
5—Imperfectly cleaned bearings,
6—Metal particles,
7—Moisture (from atmosphere or compressed air).

Effects of Dirt

Dirt is composed of myriads of particles which, when mixed with the lubricant, forms a *lapping compound.* Thus, the revolving action of the bearing will gradually destroy the accuracy and efficiency of the bearing, eventually causing its failure by:

1—Reduction in the diameter of the balls,
2—Destruction or enlargement of the bearing races,
3—Wear or destruction of the ball cage,
4—Accelerated fatigue of the balls and races.

Improper Lubrication*

The useful life of a ball bearing, correctly applied and suitably lubricated, is limited only by fatigue flaking of some part of the load-carrying surfaces.

Some of the more common causes of bearing failure due to improper lubrication are:

1—Too much lubricant,
2—Insufficient lubricant,
3—Improper lubricant for bearing speed or operation temperature,
4—Oxidation of lubricant,
5—Mixing of different lubricants.

Misalignment

Misalignment, or tilting of the bearing, may be caused by:

1—Bent shaft,
2—Housing not at true right angles to shaft,
(End bell not properly seated on motor housing, etc.)
3—Projection (burr) or foreign matter preventing bearing correctly seating against shaft shoulder,
4—Bearing spacer faces not parallel or off-square,
5—Brinelling of bearing seats by hammer blows, etc.,
6—Dirt or foreign matter between bearing and shaft or housing,
7—Scored shaft, caused by forcing tight bearing on shaft or in housing.

Misalignment of a bearing may have two effects:

1—Create a concentration of overload in certain portions of the bearing due to squeezing of the balls between the races, including metal fatigue and spalling of balls and races,
2—Destruction of the retainer by jamming of the balls due to the variation in the speed of the balls at the wide and narrow points of the races.

Overload

It will be remembered that, for this discussion, it is assumed that the proper type and size of bearing has been provided for the load application. Therefore, an overload should not exist. Unfortunately, certain conditions may be imposed upon the bearing which will create an overloaded condition. Squeezed bearings and external pressure are other conditions which create overload.

1—Squeezed Bearings.
  a—Too tight press fit,
    Occasionally, under extreme conditions—due to tolerance allowances—a bearing will fit too tight on a shaft or in a housing. If too much pressure is used in mounting, the bearing will be squeezed.
  b—Shaft or housing out of round.
    1—Scored shaft or housing,
    2—Foreign matter between bearing and shaft or housing,
    3—Mechanical injury to shaft or housing.
2—External pressure.
  a—Tight belts,
  b—Misalignment of gears or bearings (of driven load),
  c—Misalignment of couplings,
  d—Bent shafts (of driven load),
  e—Excessive overhang of pulleys, gears or couplings.

Effects of Overload

An overloaded bearing will usually manifest itself by becoming over-heated. The overload may cause:

1—Spalling of the balls and races.
2—Acceleration of fatigue of the balls and races,
3—Destruction of the lubricating quality of the grease.
4—Annealing (softening) of the load carrying surfaces of the bearing.

Excess Thrust

Excess thrust is, in reality, another form of overload. It frequently is the result of interchanging housings, endbells, spacers, etc., when reassembling a motor. Causes of excess thrust are:

1—Improper bearing spacing.
  a—Interchanging of bearing housings, spacers, endbells, etc.,
  b—Bearing not forced up tight against bearing shoulder.
2—Magnetic pull.
  a—Reversing rotor in stator,
  b—Magnetic center of rotor out of line with stator magnetic center.
3—Improperly adjusted or aligned gears, couplings, etc.
4—Poorly designed or sticking couplings (preventing free end play).

*Lubrication of ball bearings will be treated more thoroughly in a separate article at a later date.

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Advertising Critics

WHEN the national advertising sponsored by a group of fifty-odd operating companies first made its appearance some months ago, there arose a legion of critics who poked holes in the copy, derided the illustrations, questioned the effectiveness and otherwise inveighed against this cooperative effort to invoke a better public appreciation of the industry. As the months passed and the technique and strategy of the advertising messages became more apparent, the criticism faded to a whisper. Furthermore, additional companies joined in the undertaking.

If there is any doubt in the mind of people in the industry today as to the effectiveness of the messages, then he should give heed to two recent addresses by Leland Olds, chairman of the Federal Power Commission, whose leanings with respect to the industry are well known. Speaking before the annual meeting of the National Industrial Conference Board in New York on May 20, Mr. Olds described utility advertising in this fashion: "In comparison with the un-American advertising that the industry is spreading so lavishly in an effort to nullify and confuse the democratic processes and destroy the freedom of the press. . . ." A few days previously, addressing the annual North Carolina State Industrial Conference he said this: ". . . I think that the utilities might well use the advertising, which today closely approximates that held up to opprobrium in the Federal Trade Commission Investigation of 1928-35, to educate consumers to an understanding of how they can contribute most when the call for curtailment comes."

Neither of these statements are expanded in the addresses. Both are open to argument. They are submitted here as proof that the current national advertising program is achieving its purpose. Otherwise it would have not brought forth such caustic statements from the head of the FPC.

Canada Rations Engineers

MANY of the wartime limitations, restrictions, rationing and compulsions have been patterned after experience and developments in some of our allied countries, notably England and Canada. Both of these countries have been subjected to many more of the war's pressures than has the United States. Hence the steps each takes to meet new emergencies may serve as a guide to what might occur in this country sometime later.

If this is the case, then all engineers and technical men should be interested in a new Canadian war measure which drafts engineers for war service. Under the terms of this order all Canadian engineers must (1) accept a position in a war industry on 30 days' notice; (2) register with the Wartime Bureau of Technical Personnel; (3) notify the bureau upon leaving employment or when available for employment, and (4) not enter employment without approval of the bureau. Penalty for violation of any of these provisions is a $100 fine. Similarly, an employer must (1) release any engineer or technician on 30 days' notice; (2) reinstate men drafted at the end of the war; (3) not hire any engineer without permission, and (4) notify the bureau when any engineer or technician ceases employment. In this case the penalty for violation of any of the provisions is a fine of $500 plus, for failure to reinstate, three months' salary to the employee.

In this fashion Canada hopes to ration its technically trained manpower among the armed forces, industries, universities, research laboratories and all other places where essential war work is performed. It is aimed at preventing "raiding" of one organization by another, and at equitably spreading the supply of technical men among the jobs where they are needed.

In two respects is this significant in this country. First, it is in distinct contrast to the tactics of some of the Selective Service Boards which have drafted third-year engineering students from some of the universities and have also taken technicians

from the staffs of industry and the universities themselves. More important still, however, is the fact that some such rationing program may be adopted to meet the ever-increasing shortage of engineers in the United States.

This Won't Win Wars

WAR and public power promotion don't mix if the outcome of three Oregon PUD elections reported in the news columns means anything. Two measures were soundly whipped, one of them for the fourth time. The third was defeated by a narrow margin in a bitter contest that aroused widespread press and public indignation. Allegations that the Bonneville Power Administration actively took part in all three elections were freely made, despite recent Congressional declarations of Dr. Paul Raver that the Bonneville staff takes no part in PUD promotions.

Most unfortunate feature of the three campaigns was a cartoon type advertisement which appeared simultaneously in several papers with different signatories in each district. This advertisement was headlined "7% Patriots" and it depicted a loathsome figure, evidently representing the power companies, wrapped in the American flag. It did the cause of the proponents no good because public reaction was definitely unfavorable. In fact an American Legion post in one county, together with outraged citizens, bought newspaper space to condemn the advertising. Employees of Northwestern Electric Co. similarly demanded an apology in newspaper advertising terming the PUD ad "an insult to the 25 members of the Northwestern organization now wearing the uniform of the United States. . . ."

These columns have frequently decried this type of political power promotion. The thought has been expressed more than once that it should be put on the shelf, at least for the duration of the war emergency. It is the kind of thing that fosers disunity and dissension. It contributes nothing but obstacles to the winning of the war.

Sell the War

SOME three million people in selling activities in the United States are being dispossessed of their immediate jobs by the war, for selling is not thought to be necessary when things to sell are removed from the counters. Many of these sales people are being drafted or are entering the armed forces. Some, possessing other skills, are taking war industry jobs. Many have found their way to a desk in one of the numerous war boards and agencies, doing the paper work, interpreting regulations, part of the "non-productive overhead."

Yet for a job that needs doing, and at which they are perhaps the best fitted of all, they are not being enlisted to do. Their art of persuasion, their ability to teach, to convince, in other words to sell, is not turned to where it will do the most good. That would be in selling the war.

Doubtless those in charge think the war needs no more selling, that its issues are obvious and the need to win it so certain that no one needs convincing. Perhaps such an opinion stems from a lack of appreciation of salesmanship as a vital force in American life. In some quarters, certainly, advertising and salesmanship are thought of as unholy. In other quarters salesmenship is only thought of in terms of moving goods to market, not of moving minds to action.

But there is a need for continued salesmanship. Treachery at Pearl Harbor stirred up the American people to a tremendous purpose, yet the fronts on which the war is being fought are so far away that there is danger the discomforts of war restrictions may seem more important than the cause of world freedom and decency. The greater goal, the reestablishment of a world in which men, women and children can live in self respect and honor, needs to be kept sold. What better job is there to give these trained salespeople?

A PROMINENT English churchman once remarked jokingly that there were three sorts of Anglicans: the low and lazy, the broad and hazy and the high and crazy. It seems to be much the same among engineers in our thinking about our profession. We have a low church party, indifferent to forms and organizations, which holds that status and titles are of little consequence; so long as the public allows us to claim them not much else matters if the engineers do an honest day's work. The broad church party is all for inclusiveness; if business men and industrialists wish to call themselves engineers, let us take them in and do them good, not forgetting the more expensive grades of membership. The high church party is all out for exclusive definitions and a strictly regulated legal status; in their eyes, what marks a man as a "professional" engineer is not his learning, his skill, his ideals, his public leadership—it is his license certificate.
—William E. Wickenden, president, Case School of Applied Science, in a pamphlet "The Second Mile."

Mullendore, Bennion, Downing

Conferences Tackle War Tasks

PCEA substitute convention concentrates on adjustments required by war restrictions, affecting every branch and phase of the electrical industry

IT WASN'T a convention, but no convention ever packed more vital discussion into such short space as did the three conferences of the Administrative Services, the Business Development and the Operating Economics Sections of Pacific Coast Electrical Assn., held on two successive days, Thursday and Friday, May 28, 29, at Fresno. Wartime need for utility personnel on duty and wartime worries to manufacturers, distributors and contractors kept the attendance small. Yet those who attended were key executives and the topics they talked about were stark reality. They met to exchange ideas and methods by which to speed the winning of the war so that electricity might the sooner be mustered out to go back to civilian tasks.

There were no speeches, not even a presidential report from George C. Tenney, editor of ELECTRICAL WEST, president of the association. Instead discussion leaders had been appointed, pertinent topics outlined, and the entire group participated in discussion, idea exchanging, method sharing. Both the Business Development and Administrative Services Sections met Thursday in separate meetings, joining for luncheon. The Operating Economics Section met Friday. What each talked about is separately reported in the following:

Administrative

INTERNAL PERSONNEL difficulties and customer relations problems occasioned by the war shared the spotlight on the Administrative Services Section program, along with other wartime complexities. S. W. Scarfe (General Electric) and L. C. Rausch (Coast Counties G&E) had tailored the program to fit the times and the audience, with all subjects presented on a conference basis to permit ready interchange of experience and opinion.

Job evaluation as a procedure in sound personnel practice together with developments on the labor front were characterized by L. J. Nevraumont (PG and E) as subjects of immediate concern to management, based on a survey conducted just prior to the meeting. With a wartime competitive labor market coupled with the inroads of military requirements he declared that it was essential that the right people be placed in the right jobs if efficient operation is to be assured.

One method of accomplishing this was outlined by H. A. Noya (PG and E) in a description of the technique employed by that organization in job analysis and evaluation. Better training methods were assured and equitable promotion made certain by such an activity he said. Possible job analysis procedures include (1) questionnaires filled out by the employee, which fail to produce uniform results; (2) questionnaires prepared by supervisors, which may reflect personality characteristics of employees rather than job requirements; and (3) results obtained by a trained personnel analyst, which he declared was the most satisfactory. Once the analyses are obtained, then specifications are worked out by a committee, starting with the lowest and working toward the highest classification. Following this the jobs are evaluated and basic pay differentials established. Two methods can be employed, he said, expressing a preference for the "grade index scale" which gives weights to such things as complexity of the job, responsibility, education, training and extent of public contacts. A benchmark procedure in setting rates for outside employees would put common labor at the lowest point on the scale with linemen at the highest, and other jobs located on a curve drawn between.

Discussion and questions brought out that a "time progression scale" is frequently included in pay rates proceeding from a minimum at the time of assignment to a job to a maximum limit based on periodical increases. Establishment of ceilings with which employees become familiar was held to be depressing. In the case of clerical forces an anniversary date method of consideration for advancement was reported standard. In transferring people from one classification to another the point was made that an employee can't be promoted by cutting his salary. It was agreed that the most effective way of handling misfits was to use a probationary period which the new employee thoroughly understood.

Anne McDonald, labor specialist on the PG and E legal staff, reviewed labor legislation affecting wartime operations in a discussion which she herself summarized with the comment that "lawyers can say what the law *is*, but they cannot tell administrative or operating departments how to interpret or apply it."

More Accounting

Issuing the warning that the war emergency brings no moratorium on accounting, F. C. McLaughlin (So. Cal. Ed.) led a conference on wartime accounting developments. As a method for accounting for the extraordinary expenditures occasioned by the war, he urged that costs be charged against the period during which the increased income attendant on the war is derived. Protective measures fall in this category, he said, and they should not be capitalized, but should be charged against expense. Proper procedure is to capitalize only the salvageable value of investments made specifically for the war's duration. Special street lighting control equipment for blackouts and additional protective lighting for stations and grounds represent investments which should be charged on this basis.

In the case of extraordinary outlays made at or for the account of some government agency the suggestion was offered that arrangements be made to have such expenditures repaid. Another proposal was that some one specific individual be designated as principal contact man with all government agencies so as to facilitate dealings.

Typical of some of the wartime accounting complexities are those involved in allocating charges occasioned by pooling of power resources and operating jointly to insure maximum efficient use of power facilities. As an example the case was cited wherein Southern California Edison Co., which has a power interchange contract with San Diego Gas & Electric Co., obtains surplus energy from the Los Angeles Bureau of Power & Light during off-peak periods, which is transmitted to the intertie point over facilities of the California Electric Power Corp.

It was agreed that accounting departments could contribute to the war ef-

fort and to saving of critical materials in a number of ways. Cited were (1) conservation of all kinds of critical materials used in clerical activities, ranging from paper to rubber bands; (2) having every employee clean out his or her desk to uncover hidden supplies of critical materials (one official admitted finding 27 pencils in his own desk); (3) programming the most efficient utilization of office and acounting equipment so as to conserve its life; and (4) simplification and elimination of all kinds of reports that are non-essential.

As a basic accounting theorem, McLaughlin summarized the discussions with the statement that "the war emergency should not be the excuse on the part of other departments for carelessness or elimination of those things which will keep the record straight."

Back to Bicycles

Transportation curtailment is having a vital effect on credits and collection procedures according to Charles Davies (San Diego G&E) who conducted a symposium presentation of issues arising from efforts to conserve tires and manpower. Many effective emergency techniques were reported. Most companies have changed from personal collectors to mail collection wherever posible. Bicycles instead of automobiles are being used in incorporated areas by collectors (some of the older men have had difficulty learning to ride them). One company has located a bicycle at each of a series of shopping district offices in one leading large city. The collectors ride street cars from home to such office and then use the bicycle. Reductions in automobile mileage as high as 30% were reported.

Another method of encouraging payment by the customer was to put a printed sticker on the bill with this request: "Please pay bills when in the vicinity of one of our offices." A personal letter from individual collectors to customers requesting that checks be mailed has proved effective. One company is experimenting with postage-paid envelopes because some customers deducted two or three cents from the bill to cover postage. Another company reported cutting automobile mileage 50% in urban areas by establishing a dispatcher for collectors. Stricter adherence to shutoff rules was found to reduce the number of hard-to-collect bills. Some thought was being given to the use of collection agencies on overdue closing bills.

These same transportation dilemmas confront departments whose primary responsibilities are customer relations according to A. W. Althouse (So. Cal. Ed.) although their problems are intensified by personnel difficulties. Many trained service employees are leaving for higher paid war industry jobs with the resultant difficulties attendant upon training new employees. Supervisors are now instructors, and to facilitate their work, some companies have resorted to the preparation of manuals and pamphlets for new workers. Many cashiers and other clerical employees are leaving for government jobs.

Many remedies have been proposed and tried for relieving the situation. Women meter readers have been employed by one company. Swing shifts have been instituted for service men. Service programs have been streamlined with greater emphasis being placed on handling the service call by the operator on the service board, both to learn the trouble and find out if it can be remedied by the customer and also to determine whether a real emergency is involved. Many companies are only giving immediate service in cases of extreme emergencies.

Time, tires and manpower have been conserved by one company on turn-ons by attaching a card with a postage-paid detachable post card to the meter. This instructs the new occupant of a house how to turn on service by closing the main switch and requests that the card be filled out and mailed.

Free fusing is being curtailed where possible by isuing instructions to customers on how to change a fuse. After hours and on Sundays and holidays customers are requested by one company to come to the service shops and secure new fuses for replacement themselves.

Although many companies have advertised extensively for cooperation and consideration due to curtailments brought on by the war, one company is operating on the theory that advertising of any curtailment of service constitutes an admission of weakness. In this case it is felt that there was no necessity for calling the attention of all customers to a condition that would only affect a few.

Emergency Stores

Most pressing issue confronting purchasing and stores departments apart from priorities is the withdrawal of materials from stores so as to conform to WPB regulations according to Wm. DeWaard (San Diego G&E). The whole inventory program is in a state of flux, he said.

Intensified activities to reclaim scrap and collect critical waste materials were reported. Many junk piles are being successfully mined to provide otherwise unavailable materials. The list of such materials extends from simple hardware to high voltage switches. Large quantities of scrap materials have been collected through planned programs.

In combat areas dispersions of essential maintenance materials to strategic points throughout the system has been put into effect. Adequate supplies of such materials and equipment have been provided and placed at points where they will be ready for any emergency.

D. D. Smalley, Fresno, and L. J. Nevraumont, personnel director

Business Development

JUST as the factories that once made equipment and appliances to sell to the public have been converted to making equipment with which to wage war, salesmen who once sold such equipment and appliances are converting themselves to assist the war effort by helping users to apply their equipment and electric service to better advantage. But in that transition from sales to utilization and application, the conversion is not always easy. There are many casualties. It was to eye this conversion process cold bloodedly that the Business Development Section, Thursday, May 28, under Chairman E. G. Stahl, Pacific Gas and Electric, Fresno, explored the entire field of sales and utilization to see what could be done.

In the same searching tenor the noon luncheon was devoted to the Edison Electric Institute's spring conference, and to an insight into the labor situaiton. President Tenney presided over this luncheon, presenting respectively R. E. Fisher, vice president in charge of public relations and sales, Pacific Gas and Electric Co., chairman of EEI's sales committee; and L. J. Nevraumont, personnel director, PG and E, who spoke on "Labor in a wartime economy." S. E. Gates, General Electric Co., Los Angeles, was announced as the newly elected president of PCEA for next year.

Fisher reviewed in significant detail the various viewpoints and changes brought forth in the various papers at the March meeting of EEI, whose keynote was, "Winning the war, winning the peace." (Full text of these papers has been published in the *EEI Bulletin.*) He stressed especially that the industry had proved itself ready to meet any challenge so far tossed to it because it had been better organized, better equipped and had planned in advance of immediate needs as a matter of permanent policy. Post war planning, too, he warned, must be started, for the government financed factories springing up everywhere create a challenge for the future if private enterprise is to be kept alive. The importance of keeping sales department personnel somewhere in company operations during the war was emphasized because when the war ends these trained people will be needed more than ever

Proudly Fisher announced that word had been received of the winning of the Hughes Award for electric range sales by PG and E, the first time the award has ever been given to a large utility, and also to a combination gas and electric utility. Fisher paid tribute to the manufacturers, distributors and dealers who had done an outstanding range selling job and made the award possible

"Labor," said L J Nevraumont, in summing up his analytical outline of labor legislation down to present confused times, "is a Gulliver, a giant released, but being pulled down the road by two conflicting organizations. He isn't too sure where he is going. The only thing sure is that he is being taken away from the men who have been keeping him going in the past."

A wartime economy, Nevraumont defined, is one in which a government requires more things, extends more credit, has more money to spend, and less people to do the work it needs. It is measured by extent of spending by the government and the number of people involved. With this definition he compared previous wartime economies with the present one, the previous inflationary aftermaths and the imposition of new concepts of labor legislation in an attempt to reduce the damage caused by these inflationary economies upon the people. He characterized the 1933 collapse as a result of the inflation of the 1917-18 war economy but pointed to the danger of continuing under the restrictions of labor standards set up to protect labor during a surplus of labor, when the necessities of war had created instead a labor shortage.

The byplay of conflicting attitudes

E. G. Stahl, Allan Bronold, S. W. Murray and F. C. McLaughlin at Guidance Committee dinner

—the President asking for wage stabilization but the War Labor Board sidestepping it while spokesmen for labor threatened to cancel the non-strike pledge—made it difficult to guide policy and certainly to control inflation. If prices are frozen, he said, and wages continue to go up the situation smacks of "redistribution of wealth."

Nevraumont urged uniform wage policies and wage classification by PCEA members and ended by declaring that "wages can't buy morale. The shipyards will tell you that. While our kids go out and give their lives for a mere $21 a month, it isn't the money they are fighting for. We learned that we couldn't build the respect of our children by bribing them with lollypops. They need a pat on the back for their good work, or the woodshed when they are bad. It is the human touch that must be established between management and men."

Dealer Casualties of War

As a basis for a start of discussion on the effect of the war on electrical dealers, H. H. Courtright, Valley Electrical Supply Co., Fresno, discussion leader, called upon Bert Reynolds of PG and E, E. F. Meise of San Diego Gas & Electric, and H. C. Rice, of Southern California Edison Co., to tell what their companies were doing to find out the dealer's dilemna and to aid him. Once independent, Courtright said, dealers now are regimented out of business, their prices set, their terms controlled, deliveries curtailed, stocks frozen or shut off. Orders regulating them are written by legal minds which they can not understand.

Reynolds, in reviewing PG and E's program, told of opening the company's stock of appliances to dealers (but finding paradoxically many dealers wanting to sell out their stocks to the utility). Priority and regulation information too was distributed to them to guide and help. Then, at the request of the Red Cross, an informational program on the use, care and even minor repair of appliances proved to be so much in demand that similar classes are to be conducted elsewhere on the system. He then described the company's appliance repair promotion starting June 1, (description on p. 71).

In San Diego dealers were being aided by the Bureau of Radio and Electrical Appliances, said Meise. He told of the forum held there recently (see p. 66), said the utility had ceased to buy merchandise to make the entire available stock go into dealer hands, told of a new program the Bureau has started to train service and repair personnel, but emphasized that the major effort now was designed to create store traffic because dealers are changing over to other lines and store traffic will acquaint the public with these new lines and thus give material help to dealers.

Red Cross and American Women's Volunteer classes devoted to care and better use of appliances and utility services, said H. C. Rice, have proved exceptionally popular in Edison territory too. As much as anything, Rice said, it showed women what appliances they could not repair themselves but had better get competent dealers to handle. He also described the work of two committees of Los Angeles Chamber of Commerce which were endeavoring to assist all kinds of dealers to make the necessary adjustments for survival.

In ensuing discussions it was found that local conditions had much to do with dealer mortality, but in kindness to dealers, Charles Goodwin, General Electric Supply, urged that dealers not be encouraged to attempt to stay in business when they would dissipate their assets; rather they would be better off to close up, start over afresh when the war is over. The respective opportunities in appliance repair were also discussed. Bert Kramer of Westinghouse telling that a large number of better dealers did not have tools or stock to give service; Reynolds observing that in small towns local dealers would get service work and sales because transportation would inhibit large city buying; M. G. Sues, Leo J. Meyberg Co., reminding that several large service organizations which had jobbotted service for 50 to 75 dealers were best equipped to capture the service market on their own; and Ben Tassie, General Electric Co., describing the regional service station plan of his company (see p. 72).

R. E. Fisher proposed an idea—a "domestic engineering contract", which dealer service companies could sign up with home customers for an annual repair and maintenance service.

Sales Organization Changes

Second discussion session was an "adjustment of sales departments under

government limiting orders—effects on personnel, inventories, and on the buying trend of the public," with M. G. Sues as discussion leader. Sues began with a comprehensive but quick survey of the entire issue in the form of questions.

Personnel, it was brought out by Rice, are either being transferred into other departments in utilities, or directing themselves to other skills and getting war production jobs. Fisher said that service record and retirement pay kept many in the company, to make themselves available when there is merchandise to sell again. The industrial sales forces, he said, had a bigger job to do than ever before.

Inventory problems have been many. Sues told of the dilemma of the dealer and the bank where a dealer had been supplied on a floor plan deal, with little investment himself. Frozen stocks were an inventory and rent problem. Courtright said he felt the first freezing orders were made exceedingly broad in order not to miss anything, but surely would be modified. He mentioned revisions of L-79 which had unfrozen automatic washing machines connected to the water system. (While in session word was received that another amendment had unfrozen electric water heaters caught under the same ruling.)

Clark Chamberlain told of a late order, L-5b, effective June 15, which would prevent dealers from selling any refrigerators they had purchased from other dealers quitting business by limiting their sales to stock in their possession before Feb. 14. Stahl expressed the hope that establishment of localized WPB boards would expedite interpretations and assist in taking care of unfair hardships imposed by blanket orders. Goodwin urged that dealers be told what they could do, as well as aided to sell what they could, rather than discouraged by what they could not.

That the public had become afraid to buy even the merchandise available was the consensus. Dealers have been afraid to advertise, the public reads only of restrictions. Blackouts and publicity from regions conserving electricity have made it seem unpatriotic to buy. Harold Conklin, Hotpoint, warned that appliance bootlegging might spring up.

Code Changes Induced by War

E. F. Watkins, Southern California Edison Co., chairman of PCEA code and ordinance committee, and Arthur Kempston, field representative PCEA, reviewed for the benefit of the group the work done to adjust the uniform code to WPB's list of critical materials. (See p. 58, May ELECTRICAL WEST) Pressure upon municipalities for an abandonment of building codes for the duration had been resented by inspectors and would cause every inspector to rule as he saw fit, it was pointed out, but with a duration code, revokable at the end of the emergency, returning to the uniform code, would solve the problem.

By intelligent combining of receptacles in switch outlets, Kempston illustrated, more adequacy could be furnished than the restrictions at first glance would seem to indicate. He also stressed the position of the inspector as more tenable if supported by Underwriters Laboratories approved materials, and that the Laboratories were cooperating with WPB on substitute materials to retain a high safety factor.

"Application Engineers"

"Industrial sales under war time conditions," with discussion leader G. N. Hawley, Edison, was engineered as a panel discussion, with George Best, Allan Laws, James Kastl, and Allan Bronold on the panel, supplemented by floor comments. Setting up on a blackboard the major factors, Hawley, who said that industrial power salesmen were no longer salesmen but "application engineers," enumerated these factors as: changes in consumer and market, limitations and handicaps to doing business, competition if any, and adjustments to make in the organization because of the times.

Allan Bronold, Westinghouse Los Angeles manager, made a thorough review of changes in the market and the customer. Such influences as change of accent from profit to production, speed in getting under way, constant changes in personnel in the top strata of management and supervision, difficulty in contacting them, increasing influence of the government as the customer, centralized buying and shipment to fabricate into a ship or plane, engineering done in one center for erection of plant in a remote part of the country, were on his list.

H. C. Rice, vice chairman, Business Development Section and ad man R. G. Kenyon discuss the freezes

Laws mentioned sudden increases in plant size, demanding more electric service and requiring higher voltage delivery. P. P. Pine, San Diego Gas and Electric, recited Navy emergency rush orders for immediate service without waiting for priority, and subsequent WPB criticism. Utility boundaries, too, were mentioned as having no bearing in emergency service to supply war needs.

Among the limitations and difficulties encountered, Kastl, PG and E, Fresno, told of added time consumed in obtaining priorities, of the selling required to tell customers "no", of sifting out priority applications to put through only those with a chance of acceptance. Best told of another scarcity, that of skilled technical "utilization engineers", of new duties required of them, new equipment to become familiar with, new techniques to be learned (blackout and protection). Laws told of limitations imposed by restricted transportation. Hawley warned of low morale as a limitation.

Of competition Kastl said that it was in the same boat, but warned there would be plenty when engine manufacturers are released from war production. Small gas engines have already appeared to compete with small horsepower geared motor oilfield pump drives.

In summary Hawley expressed the opinion that instead of fewer, more industrial power salesmen are needed, their job is more important, their technical knowledge must be greater, the men must be of higher calibre.

"Food Will Win the War"

Because he covered the subject so completely and also because of lack of time, A. M. Frost, leader for discussion of "agricultural sales under wartime conditions," handled the subject unaided. First he reviewed the more critical situation developed since the November PCEA conclave, at which Prof. Walker had surveyed what it meant to endeavor to live up to Secretary of Agriculture Wickard's slogan, "Food will win the war and write the peace." He told how California farmers had registered to produce the quotas asked of them, appealing to Washington for tools and equipment with which to do so in face of a drain of farm labor by industry.

Despite their best intentions Frost said bluntly that the quotas would not be met this year, and next year farmers may not respond as readily because they recognize the problem. Yet they have made up their minds to do the

W. H. Brown G. R. Woodman V. F. Estcourt Col. H. S. Bennion Fred George R. D. Likely H. H. Buell F. D. Beardsley

best job they can with what they have. Agricultural salesmen, Frost said, need utmost flexibility. Theirs is a job to help farmers swap or rent equipment not in use in one place, removing it to another that can make use of it. They must talk to customers and find what they need, and must keep from letting down the 125,000 farm customers depending on them for electric service.

He mentioned the PCEA farm maintenance booklet now being given circulation by the utilities to farmers to aid them keep their plant running. He stressed the even greater importance of pump testing when new pumps or repairs are not easily available. And he ended by paying tribute to the research and experimentation carried on under auspices of the CREA and the University of California. One fruit of its research has been a small dehydrator, which when made for farmers in quantities would permit dehydration of foods for shipment anywhere to armed forces.

Wartime Lighting

Crowded for time, the subject, "wartime lighting," under leader Milo Cain, Coast Counties Gas & Electric Co., was sublet to Walter Carlson and Sam Hazleton, General Electric Lamp Dept., Oakland, to be presented in rapid fire style.

Carlson first reviewed limitation orders and restrictions, spoke of the elimination of non-essential types of lamps and the simplification of voltages, then the allocation of necessary lamp stocks to war uses. Over 400 types of lamps are required by the army and navy. War industry comes next, and civilian needs, though curtailed, will be supplied. He ended by evaluating the possible increases in production from good illumination in terms of equivalent manhours to build tanks and ships.

Speaking on the wartime responsibilities of the lighting engineer salesman, Sam Hazleton too emphasized the value of lighting in manhours saved, the great need to assist small industrials, now converting to subcontracts for war production, with their lighting improvement. Great improvement in utilization of lighting can also be had by getting proper maintenance, cleaning and painting done. He quickly demonstrated several light sources particularly applicable to plant lighting, told of added restrictions on fluorescent equipment, now requiring an A-2 or better after June 2, touched on the uses of protective lighting. Concluding, he told that West coast dimout had been placed in the hands of men in the lighting industry by OCD.

Operating Economics

HOW utilities are meeting wartime operating conditions, including conservation of manpower, materials and equipment, as well as emergency measures necessary to meet increasing war industry power demands and possible operation under actual bombing featured the discussions of the Operating Economics Section. Henry H. Buell (PG and E), chairman, and H. S. Lott (So. Cal. Ed.) vice-chairman, brought together a pertinent program in which two visitors—Col. H. S. Bennion, vice-president and managing director of the EEI, and W. D. Garbutt, electrical engineer, Hewittic Electric Co., Walton-on-Thames, England—contributed valuable suggestions

Construction and operating experience with iron wire on distribution lines and changes in street lighting operation necessary to meet the new navy dimout requirements along the Pacific Coast evoked much discussion in a conference headed by E. M. Wright (PG and E). Increasing use of iron wire may establish some precedents and reduce distribution costs in the opinion of some of those present. Satisfactory experience with iron wire that has been in service since the last World War was reported, although it had been necessary in recent years to remove some lines strung with ½-in. iron guy wire. One 60-kv. line using such guy wire was reported still in service. Short circuit experience with iron conductor has not been good, the tendency being for the iron wire to burn clear back to the copper when a short occurs near the end.

One company has ordered considerable quantities of No. 9 and No. 6 type BP telephone wire for use on rural extensions. Use of this wire was dictated not solely by priorities but by the desire to conserve critical materials. Col. Bennion stated that "many utilities are shying away from iron wire like a little boy from a plate of spinach."

Emergency material supplies for line repair in case of sabotage or bombing have been established at strategic locations. Quantities of stores have been dispersed. Spare transformer bushings are available in quantity by utilizing those on spare units. This is not true of breaker bushings. Garbutt cautioned against locating spare material too close to the point where they might be used. citing British experience in this regard.

Dimout Difficulties

Difficulties in conforming with the recent Navy dimout order ranged from obtaining satisfactory paints with which the ocean-exposed side of electroliers might be coated, to the improvisation of caps for open lamps. Dipping instead of painting ornamental units was found to be quicker and less expensive. Discarded coffee cans with a slot cut in one side, when welded or soldered to a reflector, made satisfactory caps for bare lamps. One company used papier mache cutouts for inserting in electroliers. Cost of dimming out the thousands of units visible from the ocean was reported to average $1 per unit for shielding.

Presentday substation design involves substitutions—notably wood for steel—as well as provision for protection against "incidents" according to R. D. Likely (PG and E) who led a discussion on substations. That revetments, unless properly designed, may cause more burnouts than bombings was one word of caution. Instances of faulty ventilation were cited as well as a case where the revetment had to be torn down in order to permit removal of one transformer for maintenance. One design was described in which metal ventilat-

ing pipes were placed in the lower sections of the walls. In an endeavor to reduce the cost of such protective construction, one company is experimenting with adobe bricks made on the site with dirt and a bitumastic or other binder.

That the cost of restoring service in case of damage should be weighed against the cost of protection was the warning given by Col. Bennion who cited the experience in Shanghai. He urged that additional protection to older stations should not exceed that required for modernizing to protect against oil fires. Best method of protection in his opinion is unobtrusive hiding on the theory that "out of sight is out of mind."

English experience has shown that sand and timber revetments with ventilation in the lower sections are satisfactory according to Garbutt. A gravel-filled pit for the collection of oil in case of a hit is essential to prevent fires. Also sandbagging of existing walls is not satisfactory protection against blasts.

Utter confusion exists as regards the use of essential motor vehicles during blackouts or possible attacks according to Pete Ducker (So. Cal. Ed.) This is due to lack of uniformity in municipal regulations as well as those of the Army. Only a change in state law will remedy matters. In the case of blackout lighting for emergency driving, the regulations have been changed continually and the one approved driving light is not in production, only a sample unit having been built by the manufacturer. Army regulations will permit the use of a driving light of 250-beam cp. as contrasted with presentday 60,000 to 80,000-beam cp. headlamps.

During recent blackouts civilian air raid wardens have refused to recognize emergency driving permits and have stopped utility vehicles. Also present Army regulations would prohibit the movement of any type of motor vehicles across certain designated streets and highways during attacks, thus potentially isolating large areas from maintenance operations in case of emergencies.

Operation of all utility vehicles in spirit with the ODT orders so as not to subject companies and enforcement officers to criticism was urged by W. H. Brown (So. Cal. Ed.) At present utilities are exempt from most of the provisions of these orders.

Plant Protection

Developments in metering with special reference to use of substitute materials were reviewed by F. A. Redding (So. Cal. Ed.) who told how fiber nameplates, porcelain bushings and porcelain bases are being used. Adherence to the new current transformer standards was urged, as was the reclamation of meter jewels. How modern streamlined industrial production reduces the cost of products was demonstrated in a striking new motion picture, *West Lynn*, shown through the courtesy of the General Electric Co.

Protection of hydro and steam stations against possible attack or sabotage involved a commonsense approach in the opinion of V. F. Estcourt (PG and E) and G. R. Woodman (So. Cal. Ed.) who presented a symposium on this subject. In steam stations the method is to decide which are the most vulnerable features and then proceed to protect them. Protection technique depends upon whether a station is in a zone where it might be a direct target or merely in a combat area. Basic protection should be for concussion, bomb shock and anti-aircraft shell fragments. Camouflaging is impractical in the case of hydro plants so attention has been directed toward blacking them out.

Station employees have been given a voice on committees formed for working out safety procedures, emergency operating plans and allocations to special duties in case of attack. This has been highly successful. Operating manuals for emergency situations have been prepared and distributed.

Accident prevention training has been modified to provide for emergencies that might arise in case of attack according to J. M. Buswell (PG and E). Drills in fire prevention and suppression have been organized and special equipment provided.

British utility operating techniques during and after air raids were brought out in an interview of Garbutt conducted by Vice-chairman Lott. Incidents requiring attention of utility emergency crews are reported by sector wardens to a control center. A message is then dispatched to the nearest repair center and an engineer proceeds to make an investigation before ordering out men and supplies. Emergency repairs are carried out during attacks and even during blackouts. Each utility (gas, electric, water, telephone and traction) has its own repair crews as it has been found inadvisable to combine them.

Among observations on the national situation expressed by Col. Bennion was the declaration that power rationing, if it comes, will be primarily a sales and commercial problem with the power salesman handling a difficult customer relations job. Dimouts, he reported, may involve light emissions back 50 miles from the coastline due to sky glow. With respect to special guards he pointed out that there is no substitute for an operating organization with its eyes awake and its minds alert.

"The war entails heavy obligations," he said. "There are men in industry who expect that one of the certainties of the worldwide struggle will be more socialization. However those organizations that plug away at their jobs, guided by frugality and prudence, seem to survive, despite the fact that it might appear that they would be engulfed. Utility companies with sound basic engineering will survive. The engineers will have new tools—brought forth by the industrial expansion that has come with the war. They can't afford to make mistakes in the use of these tools. Our industry will survive by standing up against stiff competition. We will have a commercial problem of the highest order based on the best interests of our customers. Commercial success depends upon the best possible engineering."

E. P. Smith C. R. Benson E. M. Wright J. C. Porter W. D. Garbutt H. A. Lott A. M. Bohnert

Montana Studies War Adjustment

Electrical inspectors and contractors discuss critical material restrictions at joint meet

BETTER to prepare electrical inspectors, contractors, wholesalers and utilities in Montana to adjust practices to the restrictions on wiring materials and critical materials, the second annual joint meeting of the Montana Chapter, International Assn. of Electric Inspectors, and the Montana Electrical Contractors Assn., was held in Great Falls, at the Rainbow Hotel, May 8-9. In the absence of C. L. Smith, city electrician, Butte, chairman of the Chapter now engaged in war work, R. R. Grant, city electrical inspector, Havre, Mont., and vice-chairman of the chapter, presided.

Newly elected president of IAEI, W. L. Gaffney, chief electrical inspector, Tacoma, Wash., and president of the Northwestern Section, reviewed the latter's contribution to the 1940 Code. An inspector's problems will be multiplied by the war emergency, he declared, but the inspector must be vigilant to maintain the highest possible standards for safe electrical installation within the limits of the materials available. An emergency committee, of the inspectors' association, composed of A. W. Adkins, and W. J. Mahan, has been appointed to guide inspectors in handling such Code questions as may arise. He urged attendance at the 1942 meeting of the Northwest Section planned for Portland in September.

Contributing to the program were representatives of manufacturers, wholesalers and the utility. W. L. Trudgian, Westinghouse, Salt Lake City, described the jobbers' adjustments to keep abreast of manufacturing changes and substitutes in the emergency and later discussed motor protection devices. L. B. Johnson, General Electric Co., Salt Lake City, not only talked on feeders, motor circuits and the Code, explaining the new Code letter rating on motors, but presented the Underwriters' film *Preventing Fires by Electrical Safety*. D. W. Dunham, district mgr., Anaconda Wire & Cable Co., Denver, explained the seriousness of the copper restrictions as well as those of rubber and told of new rubber insulation standards adopted to conserve these materials. In the absence of W. E. Lanz, of Bussmann Co. who was to talk on type S fuses, L. B. Johnson presented his paper discussing the characteristics of fusetrons, fusestats and plug fuses.

R. J. Larrabee, assistant electrical engineer, Underwriters Laboratories, Inc., San Francisco, not only presented a film showing the tests applied to materials to receive Underwriters' approval but demonstrated his field laboratory in which field tests of samples of wire and fuses are made.

Contractors' problems were discussed by Dan Goggins, Montana Electrical Contractors' Assn. Shortages of supplies with which to do repair and replacement work, and installation of defense work with available material, constitute the contractor's only source of work in these restricted times. Contractors, he said, will be content to make expenses without much profit for the duration.

Power company spokesmen were numerous and contributed not only to the technical discussions but acted as hosts to the joint meeting. D. J. McGonigle, general sales manager, Montana Power Co., H. E. Chambliss, division supt. Montana Power and member of the executive committee of the Northwestern Section IAEI; R. E. McDonough, chairman of the membership committee of the Chapter; and R. C. Setterstrom, electrical engineer, greeted the guests. C. T. Booker, division manager at Great Falls, was toastmaster for the banquet at which F. W. Bird, president Montana Power, and R. J. Kennard, Anaconda Copper Mining Co., Great Falls, were guests. R. H. Fletcher, advertising manager, Montana Power, was speaker at the banquet. Walter Neumann and R. MacDonald of the power company presented a performance of electrical wizardry.

Technical discussion was contributed by C. H. Kirk, district engineer, Montana Power, who spoke on substitutes in wiring materials and methods for the war, emphasizing that these substitutes must be regarded as temporary with standard materials to take their place after the war. Roscoe Sherman, manager of the REA at Fairfield, Mont., urged that the emergency be made a time for manufacturers, wholesalers and inspectors to simplify wiring materials and eliminate unnecessary items. The industry should endeavor to educate the public as to circuit loading too.

R. R. Grant was elected chairman of the chapter with T. Lloyd, inspector for the Fire Underwriters, Butte, as first vice-chairman, Arthur Baker as second vice-chairman, and J. Clune, Montana Power Co., Chinook, Mont., secretary-treasurer. Chairman Grant appointed as committee chairmen Arthur Baker for public relations; R. McDonough, membership; C. L. Smith, legislative; C. H. Kirk, Code clearinghouse; and to the executive committee L. B. Johnson and R. B. Setterstrom.

At the banquet, a color film *Three Dimensional Seeing* sponsored jointly by the Philadelphia Electric Co. and the DuPont Co. was presented. Curtis C. Ijames, refinish service engineer for Du Pont, explained safety as related to three dimensional seeing and color.

RMEL to Convert to War Vehicle

The Rocky Mountain Electrical League's merchandising set-up—geared to peacetime promotional activities—will be keel-hauled in a determined drive to convert it into a useful war vehicle. Activities suitable to all-out war conditions will be substituted for those eliminated by manufacturing restrictions and priorities.

This course was decided upon at a meeting of the League's Manufacturers' and Distributors' Division May 6 in Denver. A committee was created to devise ways and means for merchandising and service groups, appointed before the Pearl Harbor episode, to coordinate their efforts on war production and conservation with those of the electrical industry in general and RMEL in particular. Such a program will involve revolutionary tactics, due to lack of materials which can be manufactured and offered for sale; yet the new committee is charged with the responsibility of coming up with a plan which will serve the industry and the nation by employing talent now stymied.

The conference tendered an enthusiastic vote of confidence to RMEL, and reaffirmed a determination to increase, rather than decrease, league activities.

● EDWARD J. DUGGAN, president of the Electrical League of Utah, has named the following men to head committees for 1942:

Orson John Hyde, manager of the Salt Lake District Mountain States Telephone Co., chairman of the membership committee; Wm. J. Berryman, assistant manager of the Mine and Smelter Supply Co., chairman of the activities committee; Lester B. Johnson, district representative for the General Electric Co., chairman of the wiring methods committee. Elias J. Strong, former manager, was chairman of the committee to provide priorities information.

Pictured at the RMEL Utility Division Meet in Denver (left to right): J. W. Alexander, RMEL president; Col. H. S. Bennion, EEI vice-president; Harry Adler, chairman Accounting Section; Howard Robertson, president of Denver Tramway Corp.

Post War Planning Aim of RMEL

Business-capturing council decided upon at Utility Division Meet; war course charted

Militant leadership by J. W. Alexander, president of the Rocky Mountain Electrical League, was well suited to the conference over which he presided May 19 in Denver, when RMEL's Utility Division assembled for its annual Spring meeting.

"We must begin at this hour to rally our forces and form our battle front," he told the managers of twenty-nine electric utilities from Colorado, Wyoming and New Mexico. "While the League, since the first of the year, has taken an active part in several war and civilian defense projects, participation now must be on an even broader scale. . . . One of the immediate aims of the Rocky Mountain Electrical League is to perfect a post-war business-capturing council that will give constant attention to plans for conserving our business and our very existence."

At conclusion of the one-day session, Guy W. Faller, president and general manager of Public Service Company of Colorado was named to appoint and head up a committee such as Alexander described in his keynote speech.

Replacement of manpower drafted into the armed forces of the nation; conservation of materials due to priority restrictions; accounting and engineering techniques; and application of new and ingenious management policies to cope with war conditions were the principal subjects of discussion.

A pattern of what may be expected in electric utility operation in the Rocky Mountain Region was outlined by Col. H. S. Bennion, vice-president of the Edison Electric Institute. He related the many changes effected by power concerns throughout the nation on meter reading (employment of women and consolidation of districts), billing, (bimonthly, quarterly with interim estimates), use of alternate materials, selling of services (instead of merchandise), employment of busses and street cars instead of company equipment, etc., predicting similar, or substitute, measures soon in the Rocky Mountain West. Col. Bennion was also principal speaker at the luncheon where, among other notable features, a blackout demonstration was presented, illustrating in laboratory style the relative values of fluorescent and phosphorescent treatment of objects under air raid conditions.

Col. Bennion complimented RMEL on its foresightedness in listing unneeded equipment by the various utilities, making such materials available to other RMEL member-companies on terms of sale, swap or lend. This plan, he said, provided a clearing house where essential equipment may be requisitioned without delay.

Emphasis was placed on "bargain-counter" power that will flood the market after the war, and the invitation it will be to countless communities to engage in the electric business—to the exclusion of existing facilities—if the industry does not plan ahead to absorb such surpluses.

RMEL emerged from the managers' conference charged with even greater responsibilities as an instrument of warfare than it had carried, in years past, as a merchandising and power sales vehicle.

● E. H. Emery, of the Emery Electric, Yates street, Victoria, was reelected as president of Victoria Electrical Assn. at the recent meeting and R. T. Murphy, of the Murphy Electric, appointed as vice-president. R. B. Colby, Colby Electric, continues as secretary-treasurer. E. N. Horsey, B. C. Electric Railway Co., Victoria, was appointed honorary president.

Inspectors Slate Meeting

Plans for a completely different type of inspectors' association annual meeting are being made by Clifford Prud'homme, Sacramento city electrician, president, and Harold L. Gerber, chief inspector, city of San Francisco, secretary, for the usual annual convention of the Southwestern Section of International Assn. of Electrical Inspectors, at Fresno, Sept. 21-23, 1942. Hotel Californian has been selected as the convention location and local arrangements are in charge of Claude H. Fowler, electrical inspector for Fresno.

National speakers will present addresses treating on the scarcity of critical wiring materials to bring local inspectors up to date on recent trends. Victor Tousley, IAEI secretary, Chicago, will present interim Code changes to permit the use of substitutes and alternate materials for the emergency.

National officers this year include two westerners, Wm. L. Gaffney, city electrical inspector of Tacoma, who is president of IAEI. Ben Hill, superintendent of the electrical department in Oakland and long a member of the Electrical Committee, has been named fourth vice-president.

Rather than discussion of possible changes to the National Electrical Code in the manner conducted previously, most of the program will concern itself with safety measures to be taken in respect to use of substitute materials, to re-inspection and its contribution to "keeping 'em rolling" and to city electrical department organization as it ties in with civilian defense.

Contractors Offer Tools

Forty-four electrical contractors in greater Vancouver through the Vancouver Electrical Assn. have placed all their tools, ladders, trucks, cars and other equipment at the service of the authorities for use as desired in any war emergency.

The offer was made through John S. Homersham, secretary, and was accepted and forwarded to local A.R.P. officials by the city council.

● Despite the Focus of public attention on ways and means to blackout illumination, John A. Baker, Rocky Mountain League field representative, achieved results on the school lighting front which were unobtainable during the most fruitful promotional days before the war. Baker negotiated contracts for installation of lights according to I.E.S. standards in two Denver schools soon to be erected. One is the Montclair grade school, the other is the Opportunity School addition.

NECA Head on Tour

Despite the biggest construction program in the history of the world, few electrical contractors will be able to survive the restrictions on the bread and butter of their existence, wiring materials. This was the picture which Laurence W. Davis, managing director National Electrical Contractors Assn. of New York city, presented to contractor groups in Spokane, Seattle, Portland, San Francisco and Los Angeles last month on a quick tour of the West.

The difficulty is that the big work cannot be divided so that all contractors may share it. He gave as examples some of the big projects in Utah

Laurence W. Davis, with Clyde Chamblin, of San Francisco Contractor' group

where the electrical work alone will run over $26 million but will involve a very few contractors at the most. Many other big war projects are not built in the communities where contractors must make their living.

Even this big work is being competed for by general contractors who insist upon establishing electrical departments of their own rather than using subcontractors.

To better protect the interests of electrical contractors in this work, the NECA has established a branch office in Washington where E. H. Herzberg, formerly manager of the association in Milwaukee, has been placed as assistant to Pres. Robert W. McChesney. Paul Geary has been placed in charge of research and statistics.

For field work the country has been divided into three zones. The Pacific zone embraces the states west of the Rockies and will be covered by a representative for NECA, Davis announced.

Vancouver Group Elects

J. C. Carmichael, of Carmichael Electric, has been elected president of the Vancouver Electrical Assn. Charles Longley, Longley Electric Ltd., was named vice-president; J. S. Homersham, Homersham Electric, secretary, and Robert Sutherland, Sutherland Electric, treasurer. Other officers are: T. Barwood, Ideal Electric; R. Beaumont, Beaumont Electric & Radio; A. R. Crowe, A. R. Crowe Electric; R. Hall, B. C. Electric; B. Graham, Graham Electric Co. Ltd.; L. Sewell, Ricketts-Sewall Electric Ltd., and R. G. Wallace, Wallace Electric Ltd. The newly elected officers and directors were introduced to the association at the annual dinner meeting held in the Hotel Georgia on May 6.

Entertain Soldiers

Soldiers about to embark for war zones from the San Francisco Bay region are denied leave but they can enjoy moving pictures or listen to the radio, thanks to the Electrical Contractors' Assn. of San Francisco and Local IBEW Union No. 6 who voluntarily provided this entertainment at the embarkation point.

Two moving picture projectors of the latest type, a large screen, sound equipment and amplifiers, radios and such conveniences as electric heaters have been installed by these organizations, working through the San Francisco League for Service Men, of which Mrs. Alma Spreckles Awl and Mrs. Prentice Cobb Hale are directing heads. W. J. Varley represented the Contractors' Assn.; Charles Foehm, business agent, Local No. 6.

The association and the union likewise cooperated to provide free wiring for a recreation center in San Francisco and plans are under way for a similar one through joint sponsorship of the labor council and building trades contractors group.

American Red Cross chapters in San Francisco have been furnished a volunteer group of contractors and their crews for emergency service in the case of disaster. A committee under F. O. Sievers has appointed 16 district chairmen with four assistants in each district, and this group will furnish trucks and equipment to take care of any electrical safety hazards which may result from raids.

As a further service the building trades, contractors and workmen have assisted the service men's league in entertaining wounded soldiers returned from the Far Western battle fronts.

● AFTERMATH of the recent Denver conference of the RMEL Accounting and Engineering Section was the sending of Harry Adler, accounting chairman, to Cleveland, Ohio, for the national convention of Electric and Gas Accountants, May 11 and 12.

Varley Gets New Job

William J. Varley has been appointed field representative for the National Electric Contractors' Assn. in the 11 Western states. Announcement was made by Laurence W. Davis, general

VARLEY

manager NECA, following Varley's recent tour of the West. With headquarters at San Francisco, he will work with local NECA chapters throughout the West and will represent the contractors in business relations with general contractors, awarding authorities, electrical unions and public officials. For the past five years, Varley has been business representative of the San Francisco Electrical Contractors' Assn.

EMEA Inspects Plant

Opportunity to visit an electrical manufacturing plant these days is so rare that the Electrical Maintenance Engineers Assn. of Northern California took full advantage of it when Westinghouse Electric & Mfg. Co. arranged to permit such a visit to its Emeryville, Calif., plant, Apr. 23. Identified and badged, after being fed at a nearby restaurant, 200 members and prospective members, broken up into groups of 10 or 12, were taken through all departments except insulator making.

How motors and transformers were wound, assembled, switchboards made up, repairs and servicing handled, tests on equipment performed with surge "lightning" discharges, all were seen by the groups as the night shift worked away. Experienced staff personnel from Westinghouse acted as guides, describing operations, answering questions.

Arrangements for the successful instructive tour were handled for Westinghouse by Charles Dean, and Bud Schuler. For the EMEA J. C. Cochran, president, and Walter Heston, program chairman, handled attendance.

IES Paper Reviewed

Radiant Heat in Lighting, a paper for the Illuminating Engineering Society, was previewed by Reuben Langerstrom, illuminating engineer, General Electric Lamp Dept., Oakland, at a recent meeting of the San Francisco Bay Cities Section.

Offices of the Pacific division of the lamp company had given him a chance to study the operation of an exceptionally high intensity lighting installation in respect to radiant heat. In adjacent large offices there, where the same temperature conditions are maintained by air conditioning, the same foot-candle intensities are also maintained with different systems of illumination, fluorescent and incandescent. Bodily reaction is different though intensity and temperature are the same.

General conclusion drawn in his paper was that air conditioning is not the answer to the problem. Radiant heat is transmitted through air and is not absorbed by it. Instead, it is absorbed by the flesh and raises the bodily temperature. Therefore, it is preferable to use fluorescent lamps wherever the foot-candle intensities are to be over 50 because incandescent lamps radiate 90% of their wattage as infrared, or heat, whereas fluorescent lamps only 45%.

At the same meeting Walter Carlson, chairman, in summarizing IES activities, announced that Axel O. Olson, of the Public Utilities Commission, San Francisco, had been appointed IES regional consultant on illumination for Region H to work with the Office of Civilian Defense in Region No. 9.

IAEI Officers

W. L. Gaffney, president of the Section and chief inspector, Light Division, Tacoma, Wash., is also president of the IAEI, this year. Chairmen of the three chapters in the area are as follows: C. L. Smith, city electrician, Butte, Mont., chairman Montana chapter; E. G. S. Pryor, Washington Survey and Rating Bureau, Seattle, chairman Puget Sound Chapter; J. Hyde Staynor, Utah Power & Light Co., Salt Lake City, chairman Utah Chapter. General committee chairmen are as follows: annual meeting, Berkeley Snow, Portland; articles of association and by-laws, A. M. McLean; associate news bulletin editor, Berkeley Snow, Portland; Code clearinghouse, L. W. Going, chairman, Portland; Educational exhibits, F. E. Symons, chairman, Portland; fire and accident prevention and investigation of electrical fires and accidents, S. E. Sanislo, chairman, Seattle; legislation, F. H. Murphy, Portland; membership, L. B. Johnston, Salt Lake City; public relations, S. E. Sanislo.

● ROCKY MOUNTAIN ELECTRICAL LEAGUE received another tribute, May 8, when Denver's mayor, Benjamin F. Stapleton, designated RMEL as the official agency in charge of all blackout procedure in the Metropolitan area controlled, for defense purposes, by the Denver Defense Council. The area affected includes suburban communities encircling Denver. The mayor, at the same time, announced the appointment of George E. Lewis, RMEL manager, and H. T. Rankin, Public Service Company of Colorado lighting expert, as members of the local defense council in charge of the vital blackout program.

Meetings

"What Is Back of the Underwriters' Label?" was the subject of the meeting of the Electrical Maintenance Engineers Assn. of Northern California, May 21. H. E. Baker, assistant electrical engineer, of Underwriters' Laboratories, San Fancisco, described the local laboratory and presented the moving picture. The meeting was presided over by J. C. Cochran, maintenance supervisor of Pacific States Saving & Loan Co., newly elected president of the Association. A list of "experts" on various problems to whom the members can present questions and from whom they can obtain advice, will be worked up for the benefit of the membership. Next meeting will be June 25 and will be a visit to the Pabco plant in Oakland. Program will be under the supervision of J. E. Stewart, chief engineer, City Hall, Oakland.

Vancouver Section AIEE on May 5 heard R. W. Dobridge, district engineer, Canadian Pacific Railway, Calgary, Alberta. Dobridge, who made a special trip from Calgary for the occasion, spoke on *Principles of Carrier as Applied to Telephony and Telegraph.*

Oregon Chapter IES heard A. Glenn Stanton, architect, on *Application of Paint in Relationship to Light* at a recent meeting. At the same meeting, William Brewster discussed the *Property Owner's Viewpoint on Better Lighting* and Willard Kerlinger, Dupont Co., showed the movie, *Three Dimensional Seeing.*

Vital changes in the Code were discussed by the Los Angeles Estimators Club at the May 7 meeting. Herb Ufer, chairman of the day, led the discussion; Frank Short, Art Veit and R. H. Manahan outlined changes recently adopted for the duration by the State of California, County of Los Angeles and City of Los Angeles, respectively.

Southern Calif. Chapter IAEI met at Long Beach May 20. The discussion concerned inspectors' problems.

We Work for Victory and We Plan for Peace, a sound motion picture depicting the industrial might of America at war, was shown by Allis Chalmers Mfg. Co. at recent meetings of the San Diego Electric Club and the Electric Club of Washington.

Los Angeles Electric Club has set June 12 as the date for its stag party. The place will be Uplifters Ranch, Santa Monica; golf, dinner, games and a show are billed entertainment.

San Francisco Electric Club on May 18 heard Dr. L. Marton, associate professor of electron optics at Stanford University and for three years in charge of development of electron microscopes for RCA. His topic was *The Electron Microscope and Its Applications.*

Air Conditioning Society of San Francisco held a special meeting to consider contributions to the cooling tower investigation being conducted by the University of California. The meeting was held May 21 and $250 appropriated to continue the study. The work covers research into spray towers, atmospheric towers, spray ponds and spray nozzles. A new approach, based on a heat input equation, has been developed which will prove valuable in calculating air conditioning equipment capacity. Officers of the society were all re-elected for another year. They include I. C. Bell, Drayer Hanson Co., president: Jess E. Rauch, California Refrigerator Co., vice-president, and James R. Hedge, Pacific Gas and Electric Co., secretary.

Illuminating Engineering Society will change its usual national convention to an IES wartime conference at St. Louis, Sept. 21-22. Locale will be Hotel Jefferson. Problems of war lighting for increased factory production, as well as blackouts and dimouts, will be considered.

Illuminating Engineering Society, San Francisco Bay Cities Section, was addressed May 27 by Frank A. Hansen, IES regional vice-president and recently appointed regional light director for 8 western states, ninth region, U. S. office of civilian defense. His subject was *"Wartime Lighting."*

Illuminating Engineering Society, Southern California Section, held its annual ladies' night June 2 at the Rice Bowl in Los Angeles Chinatown. Committee was Lloyd Gates, Harold Crane and Lou Hruby.

Seattle Section AIEE heard the *Electrical Aspects of Aerial Bombardment Protection* at the May 20 meeting. F. H. Rhodes, University of Washington college of engineering, was the speaker and among problems discussed were those of electric and water supply, transportation and communication.

Associated Pot & Kettle Clubs has cancelled its national convention scheduled for Santa Barbara in July. All money in the treasury will be "frozen" in War Bonds and officers will be retained for the duration, it was decided by the organization.

A. W. Copley, Pacific Coast engineering manager for Westinghouse Electric & Mfg. Co., spoke before the San Diego Electric Club on May 12. His theme was *5,000 Years in the Future*, the aim of scientific imagination.

Western Merchandise Mart had as a recent luncheon speaker F. T. Letchfield, consulting engineer and assistant vice-president of Wells Fargo Bank & Union Trust Co.

George L. Nelson has been appointed manager of the Electrical League of Utah succeeding Elias Strong, who resigned to become secretary to Gov. Maw of Utah.

G. R. Squires, of the Federal priorities board, led an open forum at the May 21 meeting of the Los Angeles Estimators Club.

PCEA Panorama

Edited by Mary Shoop

Electriquiz

This interesting quiz comes from Leon S. Heseman, California Electric Power Co. Answers on page 138.

1. In your opinion, are there 11 or 21 or 31 privately owned electric utilities in the state of California?

2. Would you say, as of Dec. 31, 1940, these utilities served about 1,387,500 or 1,687,500 or 1,987,500 customers?

3. What company has the longest transmission line in the state of California?

4. How many agencies receive electric output from Boulder Dam?

5. How many transmission lines are there from Boulder Dam to Southern California?

6. What are the highest and lowest voltages of these lines?

7. What are the highest and lowest altitudes of electric service in California?

Farm Equipment Guide

How to Keep Farm Electrical Equipment Fit for the Duration is the title of a 16-page publication prepared by PCEA's newly appointed agricultural power repair and maintenance committee. A. M. Forst, PG and E, San Francisco, is chairman of the committee. Other members are G. N. Hawley, Southern California Edison Co., Los Angeles; E. G. Stahl, PG and E, Fresno, and B. D. Moses, University of California, Davis.

Designed as a comprehensive guide to the proper care of every piece of electrical farm equipment, the booklet covers use and maintenance operations by which the farmer may aid the nation's war effort by keeping his present equipment in service. It presents the following sections:

Dairy equipment, by Lyle W. Smith, Edison Co., Visalia.

Poultry equipment, by T. A. Wood, PG and E, Santa Rosa.

Irrigation equipment, by Lewis Reese, PG and E, Stockton, and J. P. McElroy, PG and E, Fresno.

Miscellaneous farm equipment, by Professor Moses.

The publication is being distributed by PCEA member companies to their farm customers. It shows on its frontispiece a letter of endorsement from Dave Davidson, chairman of the California USDA war board.

Pacific Gas and Electric will distribute 50,000, Southern California Edison 25,000, San Diego Gas and Electric 2,000, California Electric Power Corp. 1,500, Coast Counties 1,000 and Central Arizona 1,000.

New PCEA Officers

Gates Named to Head Group at May 21 Meet

S. E. GATES, manager of the Los Angeles office of the General Electric Co., was elected president of the Pacific Coast Electrical Association at the meeting of the board of directors held in San Francisco May 21. Mr. Gates was vice-president of the association in 1940-1941, and has been an active member for 19 years.

H. H. Courtright, Valley Electrical Supply Co., Fresno, and J. H. Pengilly, Square D Co., Los Angeles, were elected vice-presidents.

Directors elected were A. J. Bronold, Westinghouse Electric & Mfg. Co., Los Angeles; A. D. Brown, Allis Chalmers Mfg. Co., Los Angeles; J. O. Case, Quality Electric Co., Los Angeles; H. H. Cleland, San Diego Gas & Electric Co.; H. H. Courtright, Valley Electrical Supply Co., Fresno; P. M. Downing, Pacific Gas and Electric Co., San Francisco; H. L. Harper, Graybar Electric Co., Los Angeles; C. E. Houston, Southern California Edison Co., Los Angeles; M. H. Jankelson, Incandescent Supply Co., San Francisco; A. E. Strong, Coast Counties Gas and Electric Co., Santa Cruz.

They join the following directors who this year are completing the final period of their two-year term of office:

G. C. Tenney, ELECTRICAL WEST, retiring president; I. W. Borda, The Okonite Co., San Francisco; Albert Cage, California Electric Power Co., Riverside; D. E. Harris, General Electric Supply Co., San Francisco; W. C. Mullendore, Southern California Edison Co., Los Angeles; K. M. Ryals, Stone-Ryals Electric Mfg. Co., San Francisco; M. G. Sanders, Central Arizona Light and Power Co., Phoenix; J. H. Pengilly, Square D Co., Los Angeles.

N. R. Sutherland, Pacific Gas and Electric Co., San Francisco, resigned as a member of the board of directors, and D. D. Smalley, Pacific Gas and Electric Co., Fresno, was appointed to succeed him. Mr. Sutherland was retained as treasurer of the association, an office he has filled for many years. The directors passed a resolution expressing the association's appreciation of the capable and conscientious service that Mr. Sutherland has tendered as treasurer.

Who Am I?

I was born in San Francisco on May 2, 1880. After receiving my early education in Portland, I attended Purdue University from which I was graduated in 1905 with a degree in electrical engineering. Immediately following graduation I joined the General Electric Co. and have remained with the company during my entire business career. Who am I?

Work in General Electric's test, transformer design and generator design departments in Schenectady preceded my transfer West in 1908 as sales engineer in the company's Portland office. A year later I went to Boise to open an office for the company, remaining there until 1910, when I was appointed manager of the Spokane office. In 1924 I was made manager of the Los Angeles office, the position I now hold. Who am I?

I am a director of the Pacific Coast Electrical Assn. and a member of Phi Kappa Psi and various Masonic organizations. I am a past president of the Los Angeles Rotary Club and a past Rotary district governor; a past president of the Los Angeles Electric Club and the Los Angeles Engineers Club. I am a past director and chairman of the construction industries committee of the Los Angeles Chamber of Commerce, vice-chairman of the Pacific Coast Transportation Advisory Board and chairman of the sub-committee on electrical equipment of the State Council of Defense. I am a member of the Los Angeles Country Club, California Club and Rancheros Visitadores. I am married, have three children, reside in Palos Verdes Estates and my name is: See page 138.

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Demonstrate Teletalk. Its time-saving advantages, attractive appearance, and quality construction become apparent when you show Teletalk "in person." You can offer models and special features to meet every intercommunication need. You can assure your customers of quick installation, low operating cost, and years of satisfactory service.

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NEWS of the industry

JURY AWARD $7,600,000 IN TRI-COUNTIES CASE

What next step the Puget Sound Power & Light Co. will take following a jury award of $7,600,000 for purchase of its properties in Thurston, Lewis and Cowlitz counties by county PUDs, President Frank McLaughlin is not ready to disclose. Testimony in the case, known as the Tri-Counties condemnation, started April 6 and a decision was handed down May 18.

The jury deliberated five days following submission of testimony, and its award divided the total sum among the three county PUDs as follows: Thurston, $4,400,000; Lewis, $2,100,000 and Cowlitz, $1,100,000. PUD attorneys had claimed a valuation of approximately $5,000,000 for the properties while Puget Sound had asked $10,500,000. Commenting on the decision, President McLaughlin said:

"The verdict speaks for itself. My mind hasn't changed a bit as to the fact that the uneconomic and costly piecemeal condemnation of the Puget Sound Power & Light Co. is decidedly not of public benefit, and especially now in wartime it is even more clear that to tear apart this unified, interconnected system serving many vital government posts and defense industries, distributed over a wide area, is not the right thing to do.

"As I have stated many times, the opposite should be the case, tying together in every conceivable way public and private power systems so as to obtain the most effective and economic utilization of power facilities. This is the time for complete unity and cooperation in keeping with the objective that winning the war is the number one obligation of all of us. . . ."

In ruling on the case Federal Judge Fee has held that all or none of the three PUDs must accept the jury's verdict. Since the districts are contiguous, it might be possible for one to accept and leave portions of the company's property virtually hanging on the end of a limb. It is reported that acceptance of the verdict by the PUDs will likely depend upon the ability of the Lewis County district to obtain underwriting for upwards of $2,000,000 of revenue bonds.

Prior to taking any testimony, an effort was made to have the case postponed on the grounds that such court proceedings contributed nothing to the war effort, but that, as a matter of fact, they interfered by requiring valuable time of engineers and others. The judge felt that this issue was so important he invited in other companies faced with similar condemnations. Statements were produced from military officials requesting postponement so that engineers could be released for war work.

After hearing several attorneys, Judge Fee ruled in effect that the cases presented a political question in which the President of the United States, speaking through the Army and Navy, sought to have the cases called off; speaking through the Secretary of the Interior, he sought to have them continued. Until there was a meeting of minds, the only thing the court could do was to continue them.

Funds Restored to CVP For Transmission Lines

Funds for the construction of Central Valley Project transmission lines from Shasta Dam to Antioch and for engineering studies in connection with the proposed Antioch steam plant have been restored to the Interior Department supply bill by the Senate Appropriations Committee. The money had previously been eliminated by the House committee.

Total amount added was $4,178,250, of which $250,000 was for the steam plant study and the balance for additional line construction. Total appropriation for the project was set at $39,019,000.

J. B. Black, Pacific Gas and Electric Co. president, appearing before the committee argued that wartime needs and economics counseled abandonment of the USBR policy of duplication of facilities. He presented a study showing that distribution of CVP power over PG and E lines would result in immediate savings of 8,770 tons of steel, 1,000 tons of copper, 620 tons of zinc and 35,000 bbl. of cement. Coordination of Shasta Dam and Keswick power with that developed by PG and E would remove all need for the steam plant and would assure maximum returns to the federal treasury, Black asserted.

● BIDS WILL BE OPENED June 11 by the Seattle Board of Public Works for the major contract involved in raising Ross Dam on the Skagit hydroelectric project an additional 185 ft. to increase the power output of City Light generating stations. Total cost is estimated at $8,300,000.

OPERATING TIE-UP WAR MEASURE IN CALIFORNIA

Coordinated operating procedure for all private and municipal electric systems in southern California which will assure adequate power for war production has been worked out as a result of a flying visit to the Pacific Coast by J. A. Krug, WPB Power Branch Chief. Principal feature is an operating tie-up between Southern California Edison Co. and the Los Angeles Bureau of Power & Light. Outcome of the agreement is cancellation of municipal generating additions scheduled for 1943 totaling 185,000 kw. The equipment will be assigned elsewhere or not produced.

"It would be highly desirable," Krug said in commenting on the setup, "to install additional generating capacity in this area. We all recognize that if we do not bring in more capacity, we are taking a risk that may impair the kind of electric service we have all grown accustomed to in recent years. But we feel that the risks are necessary in order to conserve critical materials and equipment. . . ."

According to word from Washington a 60-cycle runner will be installed on one of the 87,500-kw. Boulder generators now supplying 50-cycle energy to Edison and one of the Edison lines will be segregated to carry this power to Los Angeles. Edison and Bureau of Power & Light frequency changers will be operated in parallel to increase 60-cycle supplies by 40,000 kw. and the Bureau system will be interconnected with the Pasadena municipal system and the Edison 60-cycle Big Creek plants.

Another phase of the plans calls for construction of a 154-kv. transmission line from Blaisdell to Drop No. 4 plant of the Imperial Irrigation District on the All-American canal, permitting California Electric Power Corp. to replace Los Angeles power with energy from Parker Dam. All of this will permit stoppage of work on the Bureau's second 65,000-kw. steam unit at the Harbor plant, deferment of the 90,000-kw. Owen's Gorge hydro development and cancellation of two steam units totaling 30,000-kw. scheduled for 1943 installation by the Burbank and Glendale municipal systems.

Krug paid high tribute to Los Angeles officials for their willingness to forego system expansion as a wartime sacrifice.

A. C. S. R. lines all over the country carry power to fighters on the home front.

Proper maintenance helps assure an uninterrupted flow of power to war industries. Hi-line or rural line, it must be kept in service to help fighters on the home front get supplies to our boys at the battle front. Your lines certainly earn the attention that's needed to keep them on the job.

The Government has recognized this need and permits the purchase of maintenance materials for power lines under ruling P-46.

You're not seeing much of the Alcoa men today who used to spread the gospel of Aluminum Cable Steel Reinforced; they're assisting in the production of vital Aluminum Alloy war materials. But this doesn't mean we've forgotten you. If you're needing advice, Alcoa engineers are ready to serve you.

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ON RURAL POWER LINES AND HI-LINES

BONNEVILLE EXECUTES INTERCONNECTIONS

Bonneville's recently executed agreements with Washington Water Power Co. and Pacific Power & Light Co. covering system interconnections will run for the duration of the war and will immediately increase the load-carrying ability of the entire Northwest power hookup by some 50,000 to 100,000 kw.

The interconnections followed a WPB request that the Bonneville Power Administration investigate the possibilities of further system power interchange as a means of fully utilizing water resources and conserving critical war materials. Paralleling of existing transmission facilities by Bonneville will cease since it will be possible to supply power to REAs and other contract customers of the power administration as well as new war industries, over existing facilities. Skamania and Grant County PUDs in Washington will be thus served.

Two interconnections are planned initially, one with Pacific Power & Light Co. at Hanford, Wash., and the other with the Washington Water Power Co. at Spokane. Others may be established by mutual agreement during the life of the contracts.

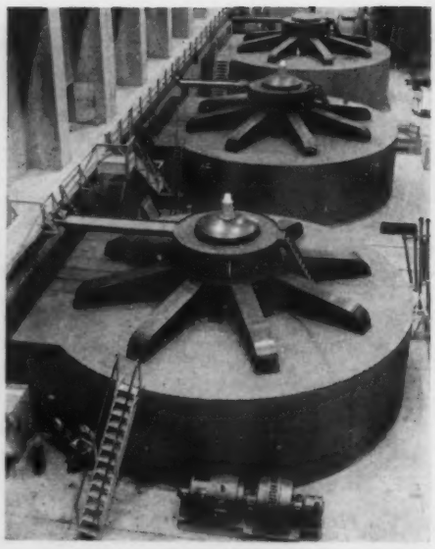
Six private companies covering a large portion of Washington, Oregon, Idaho, Montana and Utah now have a closely integrated interconnection with each other, which by coordinated operation of the generating and transmission systems involved, creates the equivalent of 50,000 to 100,000 additional kw. of capacity in the area. (See article by L. B. Cowgill in ELECTRICAL WEST, April 1942, p. 51). These new interconnections with Bonneville will make possible additional conservation of capacities through interchange of power between the federal plants and the already interconnected power systems of the business-managed electric utility companies of the region.

Shasta Units Shifted To Grand Coulee

Because the two 75,000-kw. generating units being shifted from Shasta to Grand Coulee dam are "left-handed", they will occupy three instead of two of the generator pits in the Coulee power house. Penstocks were designed for right-handed turbines. This difference has made necessary the installation of the Shasta machines in pits 7 and 8 with water being served from penstocks originally designed for pits 8 and 9.

Decision to transfer the already completed Shasta Dam machines to Coulee will make available an additional 150,000 kw. of power for war industries in the Pacific Northwest at least 12 months earlier than would have been otherwise possible. Operation is expected by Jan. 1, 1943 at Coulee, whereas units 7 and 8 at Coulee could not have been ready until at least a year later. Similarly, by Jan. 1, 1944, when power should be available at Shasta, it will come from three units now being constructed.

Since completion last year, the Shasta machines have been in storage at Boulder Dam.



Recent installation of the third 108,000-kw. unit at Grand Coulee powerhouse (above) brings the installed generating capacity to 344,000 kw. Two 10,000-kw. units at the dam serve local outlets

● BOTH PUGET SOUND Power & Light Co. and the Bonneville Power Administration have signed contracts with the Whatcom County (Wash.) PUD for supplying power if, as and when the district takes over Puget Sound facilities under a condemnation award. The Puget Sound contract runs until Dec. 31, 1945. The Bonneville contract calls for delivery not later than Jan. 1, 1946.

● THE WPB POWER BRANCH will absorb approximately one-half of the Federal Power Commission's national defense staff, who will be loaned for the duration of the war. Under a recent "treaty" the Power Branch will have jurisdiction over such wartime power matters as supply, requirements and rationing, while FPC retains full authority over plant protection, as well as its regulatory powers.

OREGON VOTERS SAY "NO" IN PUD ELECTIONS

A "No" vote was registered against all PUD and bond elections in Oregon by the voters at the primary election in that state May 15. Washington County rejected the formation of a PUD for the third time by a vote of 1.8 to 1; in Columbia County the people refused to authorize the PUD to issue $1,250,000 of revenue bonds to put the PUD in the power business by a 1.5 to 1 vote; and Union County PUD turned down its bond proposal for $925,000 by the narrow margin of 22 votes.

In Washington County, widely served by Portland General Electric Co., this PUD proposal gerrymandered out of the district the larger towns that previously had voted against the formation of the PUD. But this strategy was unavailing since voters in the rural areas left in the district recorded 2814 votes against to 1538 for. (incomplete)

The Columbia County PUD's request for authority to issue bonds presumably to buy out Portland General Electric Co. and Northwestern Electric Co. lines within its boundaries (since it is well known that no PUD could now secure materials to build competing lines) went down by a vote of 792 to 541.

In Union County, where the PUD bond authorization failed by a vote of 2130 to 2108, Dr. Paul J. Raver, Bonneville administrator, in a transcribed radio address just before election, characterized the arguments used by the Eastern Oregon Light & Power Co. in its campaign against the bonds as a "cheap type of self-serving patriotism that hides its real selfish motive behind the American Flag in order to defeat an issue of this kind." PUD advertising on the same theme, showing a bloated figure having a Jap face and draped in an American Flag, and containing the well-known quote "Patriotism is the last refuge of scoundrels," drew sharp condemnation from an American Legion Post in Union County, which joined non-legionnaire citizens in an advertisement deploring the tactics of the PUD.

Identical advertising (showing the flag draped Jap and containing the patriotism-scoundrel quote) appeared over the names of the local PUDs in both Columbia and Washington Counties. Several Northwestern Electric Co. employees in Columbia County joined in personally paying for an ad demanding a public apology.

● FPC HAS ORDERED a hearing for June 15 in Portland on an order directing Portland General Electric Co. to modify plant accounts by $13,000,000 as part of reclassification and original cost studies.

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Anaconda's Central West plants still have unfilled capacity on magnet wire and coil production . . . *for war work*. In addition to these facilities, they have experienced personnel to help solve problems you might have with this phase of manufacture.

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These Improved Insulations Are Now Available
Nylon—Vitrotex—and Formvar

The commercial development of Nylon and Vitrotex insulations is in part the result of Anaconda research . . . research that continues with redoubled effort producing new products for war work. Of course, when peace comes, the benefits of this research will be ready for industry everywhere.

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The color tells the size
FUSE PULLERS
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Pacific Industrial Products Co., 9th & Harrison Sts., Oakland, California
TRICO FUSE MFG. CO., Milwaukee, Wis.

PUGET SOUND PROPOSES REORGANIZATION PLAN

Reorganization of Puget Sound Power & Light Co. by which Engineers Public Service Co. relinquishes control under the terms of the Holding Company Act has been proposed in a plan filed with SEC and announced in a statement to stockholders by President Frank McLaughlin. Under the recapitalization program, control would pass to present holders of prior preference and preferred shares.

Present holders of prior preference stock would receive 2½ shares of new 5% dividend preferred with a $50 par value for each share now held. Holders of preferred would receive 1⅝ shares of new common in exchange for each share of preferred. Common stockholders would get one share of new common for each 22 shares now held.

New capital setup under the plan would include $46,500,000 of new 30-year 3½% bonds and $8,000,000 of 9-year 3% debentures; 275,000 shares of new 5% preferred and about 482,300 shares of new common. Approximately $60,000,000 would be required for retirement of outstanding 5½% bonds. Involved in the refunding program are possible sums to be received from PUDs which have successfully condemned portions of the company's system.

U. C. Defense Training Will Be Extended

Defense training courses conducted by the University of California will be considerably extended during the summer months, according to announcement by Charles Dalziel, supervisor of the general engineering courses for the Bay area.

Because of demand, Harmer E. Davis, Dept. of Civil Engineering at U.C. will present a more popular series on the engineering problems involved in air raid protection. This course will be open to graduate engineers of any classification. Classes will be held at the California School of Industrial Arts, known as Lick-Wilmerding in San Francisco; also in Oakland. The course is an outgrowth of a successful one conducted for civil and structural engineers both in San Francisco and at Berkeley campus during the past two months. That course will be repeated at Mt. Diablo Union High School, Concord and in Sacramento.

Norman Albert of the bureau of tests and inspection, Pacific Gas and Electric Co., will re-offer his course on electrical instruments at Lick-Wilmerding, San Francisco.

At the request of shipyards and industrial plants in the bay region, a course on testing, maintenance, and trouble correction of electric machinery will be conducted by R. K. Collins, of the Westinghouse Electric and Mfg. Co. for the special benefit of supervisory electricians, journeymen electricians and electrical maintenance engineers, at the Berkeley campus. Concurrently, a course of 15 selected laboratory experiments will be put on by the staff of University of California, department of electrical engineering, at Berkeley. One section will be put on Saturday mornings for those engaged on graveyard shifts and another section on Wednesday, Thursday and Friday evenings each for a 2-hr. session.

Information as to the engineering, science, management, defense training courses offered by the University in May and June are available at the defense office of University of California, 201 California Hall on the Berkeley campus or from Lick-Wilmerding school in late afternoon or early evening. Telephone number at University is THornwall 5377.

● DIM-OUT restrictions on outdoor lighting, which have been in force throughout the province of British Columbia since January, have now been partially relaxed. W. C. Mainwaring, merchandising manager, B. C. Electric Railway Co., and chairman of the Provincial ARP Advisory Council, states that special permits will now be available for the use of outdoor lighting, where it can be proved such lighting is necessary for the successful operation of business and can be extinguished within 60 seconds of an air raid warning. Special consideration in the matter of such permits will be given to war industries and also to the use of outdoor lighting for public entertainment and public amusement, with a view to maintaining morale. Signs and porch lights are still forbidden.

● EXCESS ELECTRICITY from the station-service units of the Grand Coulee Dam power plant will be used to heat government buildings and residences in Coulee Dam, the engineers' town, and the government section of Mason City, it has been announced by the Bureau of Reclamation The change-over to electric heat will save more than 100,000 gallons of fuel oil a year for war use, it is reported.

● CAPITAL EXPENDITURES for generation, transmission and distribution for the 1942-43 fiscal year of the Los Angeles Bureau of Power & Light included in the preliminary budget submitted by the Board of Water & Power Commissioners total $17,943,000.

How to put MORE LOAD ON A FULLY LOADED SYSTEM

WITHOUT A CHANGE IN SYSTEM LAYOUT

Standard 15-kva capacitor unit

CAPACITORS—your best bet for meeting the power requirements of over-night load growth. By relieving the system of reactive kva and improving power factor, they enable the lines to carry more working current—from 1/3 to 2/3 kva for each kva of capacitors installed. In many cases enough capacity is released to forestall the installation of new feeders.

Other Advantages of Capacitors

INSTALLATION TAKES LITTLE TIME. You merely build up banks of capacitors, and then make the necessary connections. When load centers shift, the capacitors can be moved to new locations. This avoids tying up capital in idle equipment.

COST IS LOW. On many feeders, it is only $7 per kva of capacitors installed.

Ask your G-E representative for a quick estimate of the increase in capacity and of the savings possible with Pyranol* capacitors, or write for descriptive bulletin, GEA-3333. *General Electric, Schenectady, N. Y.*

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THE NEW MODEL 520

INSULATION AND BREAKDOWN TESTER

Features a super-sensitive DANGER INDICATOR which AUTOMATICALLY GLOWS to indicate leakages up to 1,000 MEGOHMS

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You can use the MODEL 520 to check between the sections of motors and generators for shorts and leakages. The 250 Volt range of the MODEL 520 is sensitive enough to indicate a leakage of 5 Megohms. If this leakage exists the motor or generator under test is unsafe and liable to short-circuit or burnout. The sensitivity of the MODEL 520 is 5 Megohms at 250 volts, 25 Megohms at 500 Volts, 150 Megohms at 1,000 Volts and 1,000 Megohms at 2,500 Volts. Therefore, the High Range will show up a leakage which is safe and periodic checks with the MODEL 520 will enable you to detect progressively higher leakages.

The MODEL 520 operates on 90 to 125 Volts 60 cycles A.C. Size 6"x8"x4¾". Comes complete with portable cabinet, test leads and all necessary instructions. Only..... $14.85

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ELECTION TO DECIDE BARGAINING AGENT

Whether the Utility Workers Organizing Committee (CIO), the International Brotherhood of Electrical Workers (AFL) or neither organization would represent outside workers in the Pacific Gas and Electric East Bay division was being decided in an election held June 2-4 under the auspices of the NLRB. The election was ordered following a NLRB finding that the East Bay division constituted a unit appropriate for collective bargaining under the terms of the National Labor Relations Act.

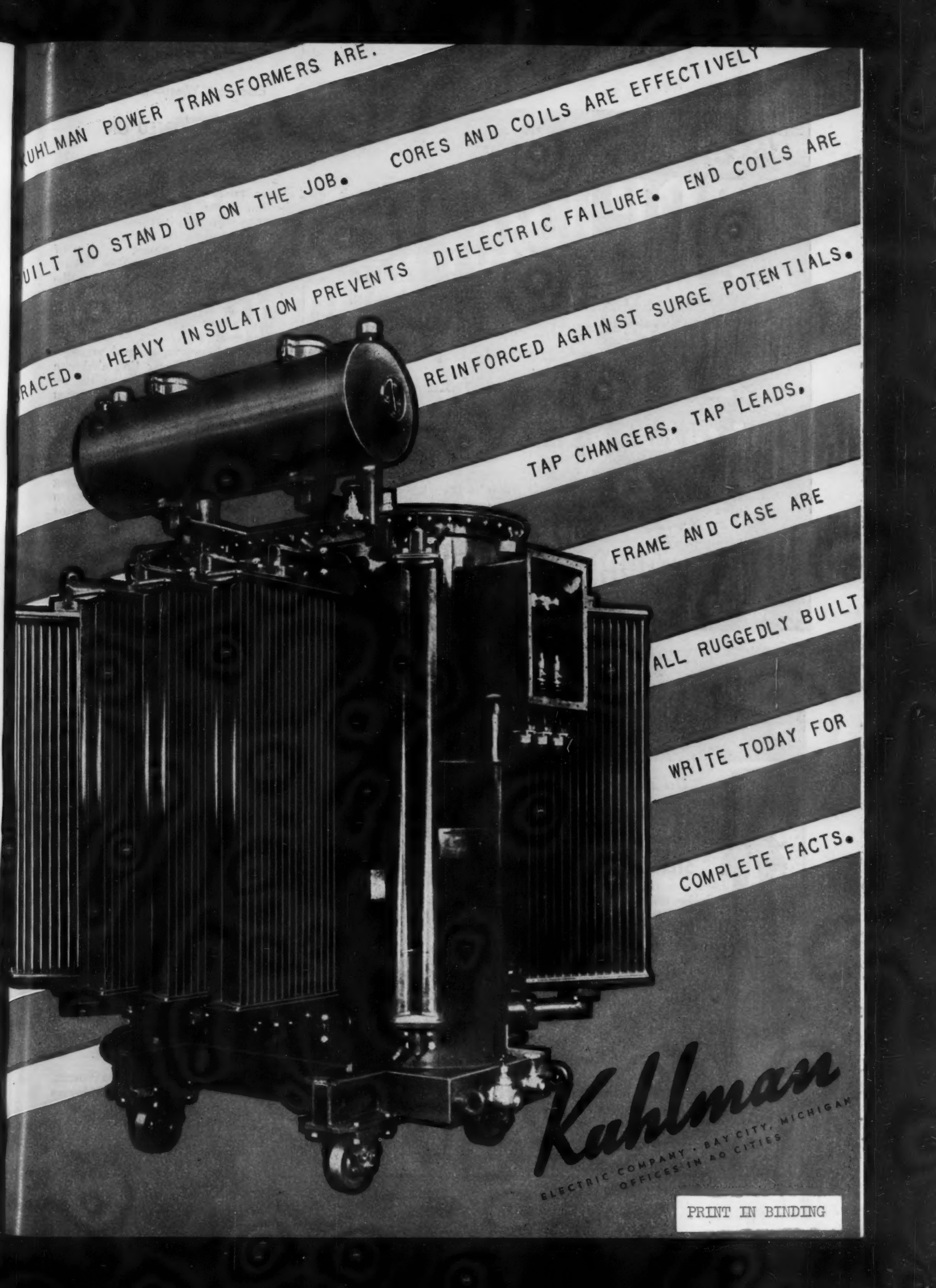
In the meantime Robert M. Gates, special trial examiner for the board, issued a report directing the company to "cease and desist" from influencing or interfering with employees' labor organizations. This report resulted from hearings held last November and December on charges brought by the IBEW of company interference in labor organizing. Gates' report also ordered withdrawal of company recognition of the Western Utility Employees Union, an independent organization of employees in the San Joaquin Power division of the company.

Highway Lighting Cuts Denver Traffic Toll

Denver's diminishing traffic toll is attributed by George E. Cranmer, Denver manager of parks and improvements, to use of mercury-vapor lamps on heavily traveled automobile arteries. To date, he announced, there has not been a traffic death at any point illuminated by mercury vapor units since the time of their installation. He said: "During the first four months of 1941, 14 persons were killed in Denver street accidents. Twelve were killed at night, and only two in the daytime.

"Denver was one of the first cities to try mercury-vapor lighting and now has more than one-third of all street lights of this type in the United States. In some instances, four of the new lights replaced forty of the old type, and gave better illumination. In other cases, reduction of the number by one-tenth means a saving of current that soon pays for the new installation."

● PUBLICATION of a new edition of its *Directory of Electric Utilities in the United States* has been announced by the Federal Power Commission. The 1,050-page book contains data on 4,457 electric utilities serving 21,586 communities. It was compiled by the commission in collaboration with the WPA from data furnished by the utilities.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The Nicopress method of splicing "80" and "130" High Tensile Steel Wire eliminates the chance of bad line joints, greatly simplifies the splicing jobs and assures splices that can be relied on to deliver long, trouble-free service.

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PROGRESS REPORTED ON UTAH POWER POOL

Utah's War Emergency Power Association, comprising all public and private electric utilities in the state, is making progress in its plans for mutual help and pooling of power resources, personnel and equipment in case of necessity. At a meeting in May reports of various committees set up for the duration were presented showing that many voluntary steps had been taken in fields where the federal government is now issuing orders.

Paul P. Ashworth, general manager of the Telluride Power Co., chairman of the power integration committee, reported on possible interconnections that would assure individual systems of ability to carry peak loads in case the largest generating unit went out of service. The Logan, Provo, Murray, Ephriam and Manti municipal systems were urged to interconnect with the existing network so as to insure protection against unanticipated load demands or equipment failures. Possibility of interconnections with industrial plants operating generating facilities is also being investigated.

Utah Firm Submits Low Bid On Davis Dam

Low bid for construction of Davis Dam at Bullshead Canyon on the Colorado River was submitted to the USBR by Utah Construction Co. The figure was $18,996,392. Utah Construction Co. was one of the members of the Six Co., builders of Boulder Dam.

Davis Dam is a $41,200,000 power project consisting of a 338-ft. earth and rock fill dam and a 225,000-kw. power house. Also included is a 220-kv. transmission line to Parker Dam. Initial construction will include a government townsite on the Arizona side of the Colorado River.

● THE 90,000 STREET LIGHTS located in the 450 square miles of the city of Los Angeles are extinguished within four minutes after a blackout is ordered, according to H. C. Gardett, chief electrical engineer of the Department of Water and Power. About 25,000 units are turned out in the first minute. An organization of 3,500 volunteer "switch captains" and alternates man the remaining 65,000, which are operated by 812 time switches.

● ELECTRICAL TESTING LABORATORIES, INC., reorganized by former employees who will have full ownership, is once again functioning in the field of electrical and general testing, inspection, analysis, research and certification.

SG-10 shown in quarter-section cut-away.

How a "Wall of Light" Blocks Plant Sabotage

Here is another substantial contribution by our lighting engineers to sustain and safeguard America's 24-hour war production schedules. It's the Westinghouse Type SG-10 Refractolux Luminaire.

This new Refractolux combines a steel-protected silvered glass reflector with better methods of light control. When installed on the sides of industrial plants or on properly located poles, the units produce a protective "wall" of intense light. Trespassers are immediately revealed as they approach plant boundaries, fences, storage areas or production centers.

We've designed this high-candlepower luminaire to assure effective, night-after-night protective lighting. SG-10 is typical of Westinghouse *engineered seeing*—the combination of scientifically designed fixtures expertly applied to achieve the best visibility conditions. Full data is available in our new Protective Lighting Planning Book, B-3085. Write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, O.

The SG-10 consists of a canopy, high or low voltage type for internal or external wiring; a socket, mogul multiple or series type; a sheet steel housing that protects the glass reflector; a silvered glass reflector, cushion-mounted to absorb shock; and either a refractor or globe. Canopies, wiring and mounting arrangements and glassware are all interchangeable. A porcelain enameled shield, with refractor type units, redirects light from the pole side, and a hand-operated toggle latch releases the hinged globe or refractor for safe, easy maintenance.

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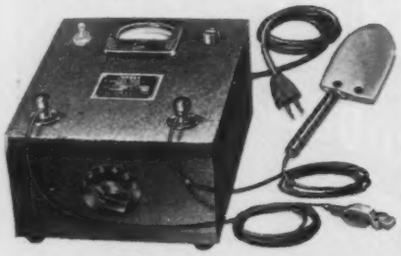
Lighting Equipment

Hesse's Utility
PORTABLE ELECTROPLATER



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DEFENSE PLANT CONFIRMS HETCH HETCHY SALE

San Francisco's arrangement for supplying Hetch Hetchy power to an aluminum plant to be located in the San Joaquin Valley has been confirmed by the Defense Plant Corp. Ability to furnish 100,000 kw. was dependent upon negotiation of a contract with Pacific Gas and Electric Co. for 20,000 kw. to supplement the 85,000-kw. capacity of the city plant. This contract has been signed, with PG and E supplying the additional power at the same rate the city is selling energy to the aluminum plant.

This now makes possible an appeal to the federal court in San Francisco to set aside an injunction which was to become effective June 30 whereby the city was estopped from delivering power to PG and E. It will be late summer before the new aluminum plant will take any power.

Utility Issues Booklet On Civilian Defense

Thousands of Southern and Central California residents are receiving helpful suggestions on civilian conduct during blackouts and possible air raids in an illustrated, eight-page booklet published by the Southern California Edison Co.

Reviewed and passed by the Office of Civilian Defense, Washington, D. C., the book offers official pointers on what to do if an air raid comes, arrangement of window coverings to make possible continued use of ordinary interior lighting in a blackout, and how to control incendiary bombs. Elementary rules of first aid are given, and attention is directed to clearing attics, basements and garages of accumulated inflammatory materials. A discussion of home cooperation in civilian defense completes the presentation of timely information.

The booklet is being distributed through civilian defense, law enforcement and school channels. It was prepared under the direction of R. G. Kenyon, advertising manager, Edison Co., and G. M. Rankin, Edison director of lighting and member of the Los Angeles county civilian defense light coordination committee.

● DEVELOPMENT of a successful medium of exchange for farm electrical equipment not now being utilized by owners is being studied by a number of western power companies. Some companies are doing this in specialized advertising copy published in rural weeklies. Others are utilizing bulletin boards in their offices located where customers can see them. Still others utilize the pages of a house organ which circulates among rural customers. Initially data on equipment available is usually uncovered by the companies' rural representatives. Soon the farmers volunteer such information. All companies using the idea report that it is a valuable means of putting all available rural electric equipment to work in the war crisis.

War Delays PUD Take-Over In Oregon Community

Delay in the take-over of certain facilities of the Mountain States Power Co. by the Tillamook (Ore.) PUD. is indicated in a recent statement by J. L. Steinbach, PUD secretary, in which difficulties attendant on the war are given as principal reasons. As reported in the press, the statement says that the $750,000 revenue bond issue voted in 1940 would prove insufficient to purchase the system and make necessary extensions and rehabilitations.

Promised rate reductions would not be possible, Steinbach said, unless a line could be built into the district by Bonneville, which is questionable because of the critical war material situation. Furthermore promised rural extensions could not be built for the same reason. He reported that rates would have to remain unchanged for the next three or four years, or until Bonneville power was available.

● TO PREVENT WASTE of electric power, all industrial power users on the lower mainland of British Columbia are being appealed to by the B. C. Electric Railway Co. to correct power factor by Oct. 1, next. A clause dealing with power factor requirements has been in all contracts for many years and up to the depression good progress was made towards correction. Lately power factor has been getting worse and in the interests of the power supply for war industries the capacity of power plants must be conserved.

● DISTRIBUTION FACILITIES of Northwestern Electric Co. and Pacific Power & Light Co., serving approximately 600 customers has been purchased by the Skamania (Wash.) County PUD for $101,000. Purchase resulted from condemnation proceedings completed last February.

● CAPACITY of the Bonneville power plant was increased to 302,000 kw. late in May when the sixth generator went on the line after a brief period of drying out, followed by load rejection tests.

There is no unguarded moment in Anaconda's "control" research; the war program and our industry can thus count on the uniform dependability in every Anaconda wire and cable.

KEEN-MINDED technicians peer intently into metallographic microscopes, day in and day out, watching, watching to see that flawless metals go into every Anaconda wire and cable that is delivered to war-vital work.

Unceasing control like this has earned its "keep". For, throughout industry and now in the army and the navy, users have learned they can lean heavily on the dependability of wires and cables bearing the Anaconda trade-mark. And that isn't all.

They have recognized Anaconda research as a source for many product improvements and for many completely new developments . . . such as Type CB* construction that outlasts ordinary shielded paper-lead cable three to one. This research is a boon to our war effort . . . it will be equally valuable to industry with the return of peace.

*CB—Trade-mark Reg. U. S. Pat. Off. 42242

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

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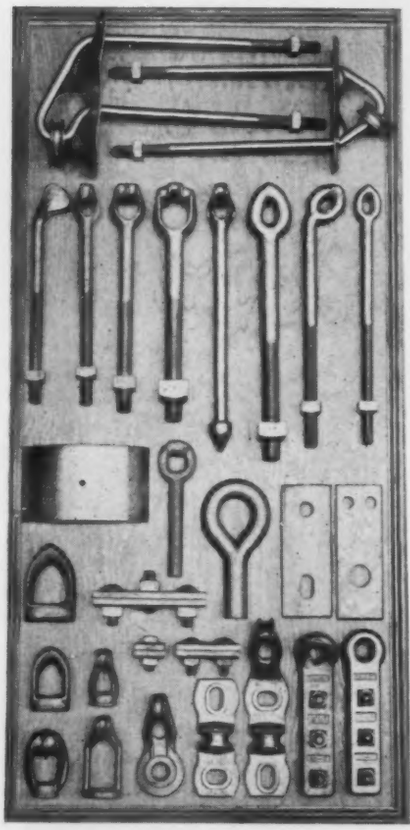

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OFFICE—PLANT—WAREHOUSE

345 First St., San Francisco

Telephone GArfield 8080

Answer to "Who Am I?"
(See Page 124)
S. E. Gates.

Electriquiz Answers

1. 31, according to the 92nd annual report of the California Railroad Commission, p. 19.

2. 1,687,500. Source: same as above, p. 14.

3. California Electric Power Co. — 539 miles, from Poole Plant near Mono Lake to Yuma, Ariz.

4. 15—Cities of Los Angeles, Burbank, Glendale and Pasadena; Southern California Edison Co., California Electric Power Co., Southern Nevada Power Co., Lincoln County (Nev.) Power District No. 1, Metropolitan Water District, California-Pacific Utilities Co., Citizens Utilities Co., Salt River Valley Water Users Association, Indian Office, Parker Project and Boulder City. Source: U. S. Bureau of Reclamation.

5. 7—City of Los Angeles, 3; Southern California Edison Co., 2; California Electric Power Co., 1; Metropolitan Water District, 1.

6. Highest, 275 kva., City of Los Angeles; lowest, 132 kva., California Electric Power Co.

7. Highest: It is believed that the California Electric Power Co.'s service to the U. S. Vanadium Co. on Morgan Creek near Bishop, Calif., at a height of 11,000 ft., is the highest.

Lowest: 200 ft. below sea level, agricultural customers near Mecca, Calif.

● YAKIMA COUNTY (Wash.) PUD has abandoned its effort to construct a power line from the Moxee substation to serve the Lindeman Power Equipment Co., in Yakima.

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"Wire-Nuts" do not use Lead, Tin and Rubber, as required in solder-and-tape joints. Save critical materials and the trouble getting them. **Fully Approved.** Listed by Underwriters' Laboratories, Inc. "Wire-Nut" joints quickly pass inspection. Better Electrically; Stronger Mechanically, Safer; no flaming torch. Sizes for all jobs.

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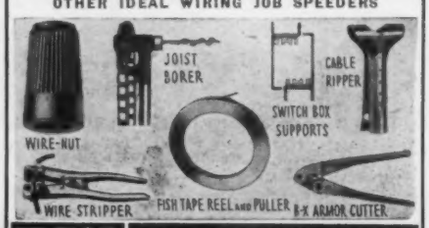

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GENERAL ELECTRIC
LAUNCHES NEW APPLIANCE SERVICE PROGRAM IN WESTERN STATES

OPENING JUNE 1st

351 BRYANT STREET SAN FRANCISCO

. . . A new G-E factory-operated Service Center to aid distributors and dealers in local appliance service activities.

With a large and complete stock of parts—shop facilities for full factory service—G-E trained repair men—and a staff of product engineers, General Electric's Appliance Service Center in San Francisco will act as western headquarters for the company's new wartime service plan.

Dealers are invited to inspect the new Service Center, where 40,000 square feet of floor space are now devoted to appliance repair shops, testing rooms, and parts warehouse.

WILL APPOINT QUALIFIED DEALERS AS LOCAL "APPLIANCE SERVICE CENTERS"

The opening of its factory-operated Appliance Service Center in San Francisco inaugurates General Electric's wartime service program—designed to help both G-E Appliance users and G-E dealers.

. . . Users will get more complete and more convenient service than ever before.

. . . Qualified dealers will be offered a new profit opportunity in appliance service.

The new program is built around the expanded and improved operations of the factory-operated Service Center in San Francisco. From its large and complete stock, dealers will be able to get parts within a day or two . . . Factory repair service and product engineering assistance will be available on practically all household appliance and equipment manufactured by General Electric.

Dealers will participate in the program as authorized G-E Appliance Service Centers in their local communities . . . and will act as headquarters for all G-E Appliance Service . . . and KEEP THEM WORKING.

GENERAL ELECTRIC

APPLIANCE SERVICE CENTER
Telephone YU 2056

351 BRYANT STREET, SAN FRANCISCO
H. M. Wade, Service Supervisor

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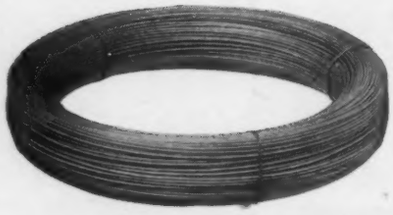
To Conserve Copper ★ To Cut Maintenance

Distribution engineers today are using *Crapo* HTC-130 Steel Conductors wherever practicable. For, these high-tensile, low-resistance steel conductors make possible longer spans with greater ground clearances, reduce the number of pole structures required, save valuable man-hours.

Developed primarily for branch lines of rural distribution systems, *Crapo* HTC-130 Steel Conductors now are being used—within the limits of their capacity—for other installations. They are surprisingly efficient electrically with 60-cycle alternating currents.

In any case, you'll be sure to find it advantageous to order *Crapo* conductors or other pole line needs "via GRAYBAR". You'll get what you need with a minimum of delay—subject, of course, to current priority regulations. Just call your local GRAYBAR representative.



Crapo HTC-130 Steel Conductors provide high tensile strength with a minimum of electrical resistance. Available in Nos. 4, 6 and 8 stranded (3-wire) type, in continuous lengths without splices or welds.

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ORDER PAVES WAY FOR YUBA RIVER PROJECT

Federal Power Commission approval of transfer to Pacific Gas and Electric Co. of Sacramento Valley Utility Co.'s interest in a major license for a power development on the Yuba River, Calif., has been announced.

License for a 12,500 hp. hydroelectric plant was issued to the two companies jointly in August 1941. The joint application for transfer of interest, filed in October, 1941 provides for dissolution of the Sacramento Valley Co.

The project location is near the Government's Upper Narrows Debris Dam in Nevada County Calif.

Columbia Steel Begins Expansion Program

Additions and improvements to its plants at Pittsburg and Torrance, Calif., to increase materially their production of steel have been announced by Columbia Steel Co., subsidiary of United States Steel Corp. The expansion program, which will be undertaken with the corporation's own funds at a cost of approximately $8,500,000, will include additional open hearth and electric furnace capacity.

Construction of new iron and steel producing finishing facilities in California and Utah is included in the 10,000,000-ton steel ingot expansion program recommended by Government defense authorities and being built for the most part at the expense and for account of the government.

● LAST MONTH Bonneville began delivery of power to a new Pacific Northwest shipyard and to another large aluminum reduction plant in the Columbia valley area, according to Paul J. Raver, administrator. At the same time it was announced that authorization had been received to install electric facilities for a large ferrosilicon-magnesium plant in eastern Washington. When in full operation, the three plants will require more than 150,000 kw., Raver said.

● REDUCTION IN NIGHT ACCIDENTS achieved by sodium lights installed at Los Angeles intersections was broadcast to the nation recently by Frazier Hunt, as part of his news program conducted for General Electric.

Hunt, a former war correspondent now doing a news broadcast over CBS, pointed out that at 25 intersections where the sodium lights were tested by Los Angeles, traffic injuries and deaths at those points were reduced to less than one-fifth the previous toll.

HOW MANY FOOT CANDLES FROM HERE TO VICTORY?

TODAY better working daylight is a major offensive weapon. MILLER Continuous Wireway Fluorescent Lighting System provides it . . . 50 foot candles, 100 or better, to speed production . . . plus noteworthy savings in power, dollars, manhours and critical metal.

MILLER 50 FOOT CANDLER and 100 FOOT CANDLER will put 50 foot candles, 100 or better on every working surface in your customers' plants. MILLER TROFFERS will duplicate that performance in plant offices and drafting rooms.

Science says men will work better, faster, more accurately under this quality of illumination. Field facts on MILLER installations confirm this.

But that isn't all.

It is significant, for instance, that the MILLER Fluorescent System delivers maximum light output per kilowatt . . . so vitally important to you today in Uncle Sam's power conservation program.

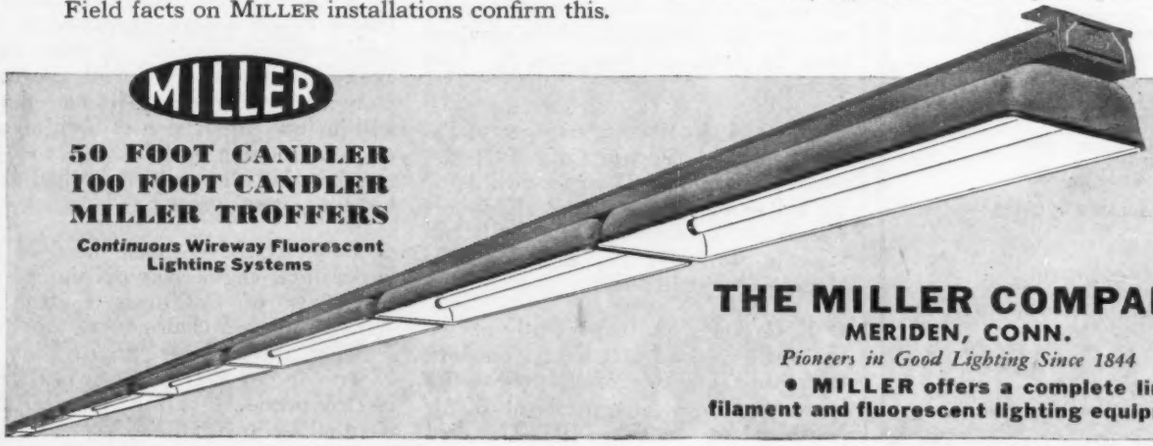
And, speaking of savings, don't overlook the MILLER *continuous wireway* (containing all necessary operating auxiliaries) which permits reductions of from 30 to 50 per cent in installation costs . . . plus additional savings in valuable manhours.

Finally, engineering surveys show a saving of up to 47 per cent of copper, steel and other critical metal may be obtained when the MILLER Continuous System is employed, taking into account all items (power plant, distribution, controls, wire, etc.) making up the *complete* lighting installation.

If you are sparing no effort to help your customers speed war production . . . *write now for full details.* (Representatives in principal cities.)

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS
***Continuous* Wireway Fluorescent Lighting Systems**



THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844
• MILLER offers a complete line of filament and fluorescent lighting equipment

DEFENSE Can't Wait FOR Hand-Hammered ANCHOR HOLES

WHEN PAINE "SUDDEN DEPTH" DRILL BITS WILL DRILL THEM FASTER

- Drill anchor and conduit holes 50 to 75% faster in masonry and concrete
- Eliminate danger of wall fracture
- Operate quietly
- Hold edge longer than star drills
- Easily sharpened on grinding wheel
- Big time savers in close quarters

Ask your supplier TODAY for PAINE "Sudden Depth" Drill Bits and write for catalog.

THE PAINE CO.
2983 CARROLL AVE. CHICAGO, ILL.
Pacific Coast Representative
PAUL ATCHISON
2711 So. San Pedro, Los Angeles, Calif.

GEO. E. HONN CO.
420 Market St. San Francisco, Calif.

Manufacturers' Representative for

INSULATORS
R. Thomas & Sons Co.

FUSES, RESISTORS, MOUNTINGS, CUTOUTS, FUSE LINKS, DISCONNECTS, BUS SUPPORTS
Schweitzer & Conrad, Inc.

CAPACITORS
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GUY GUARDS, ANCHORS, EARTH AUGERS
The Specialty Device Co.

CURRENT TRANSFORMERS, NIAGARA AIR INSULATED
Lee Skipwith Company

CABLE GRIPS
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CONNECTORS, GROUND ROD CLAMPS, UTILITY HOISTS
Jasper Blackburn Products Corp.

GROUND LINE POLE AND GREEN WOOD TREATMENT
Osmose Wood Preserving Co.

TONG TEST AMMETERS, LOW VOLTAGE GENERATORS
Columbia Electric Mfg. Co.

UNDERGROUND CABLE TOOLS & EQUIPMENT
T. J. Cope, Inc.

TREE TRIMMING EQUIPMENT—TREE SURGEONS' TOOLS
Bartlett Manufacturing Co.

METER JEWELS
Herman D. Steel Company

CROSS ARMS
American Cross-Arm Incorporated

PEOPLE
made this news

Hector Keesling, PG and E Engineer, Succombs

Stricken with a heart attack while answering a call to air raid warden duty at San Francisco on May 3, Hector Keesling, PG and E construction engineer, died before reaching the hospital.

Mr. Keesling was born in San Jose, Calif., on Sept. 29, 1886. He was graduated from Stanford University in electrical and civil engineering in 1909 and in 1911 joined Pacific Gas and Electric Co. He had a distinguished record of more than 30 years with the Company, working mainly on hydro-electric construction projects.

HECTOR KEESLING

During the first world war he served with the AEF in the Signal Corps, and was advanced from the rank of lieutenant to that of captain.

His widow is the daughter of P. M. Downing, vice-president and general manager of PG and E. He is survived also by four children and by four brothers.

● Oscar A. Kommers, manager of Pacific Gas and Electric Co.'s Taft district for more than 23 years, died April 10, following a long illness. Kommers was born in Wisconsin in 1891 and went to work for PG and E in the Madera district in 1912.

● E. G. S. Pryor, just recently named chairman of the Puget Sound Chapter, International Assn. of Electrical Inspectors, and a past president of its Northwestern Section, 1936-37, died April 7 after an operation. Pryor was resident engineer for Underwriters Laboratories, Inc., in Seattle and connected also with the Washington Surveying and Rating Bureau. He began as a journeyman in Washington, D. C., worked in Puget Sound Navy Yard as electrician in 1914, then entered Pratt Institute from which he graduated in 1921. Following this he took the student test course at Westinghouse and joined Underwriters in 1922 in New York. In 1923 he was sent to Seattle as resident engineer. Active in Seattle Electric Clubs and all electrical affairs, his death was mourned by all.

PP & L Makes Shift in Division Set-up

T. E. Roach, assistant to the president, Pacific Power & Light Co., with headquarters in Yakima has been transferred to the Portland office of the company to assume broader responsibilities connected with wartime system operation. Roach was formerly president of the Washington Gas & Electric Co., and joined the Pacific organization in September, 1941. He had been in charge of the company's Washington Division.

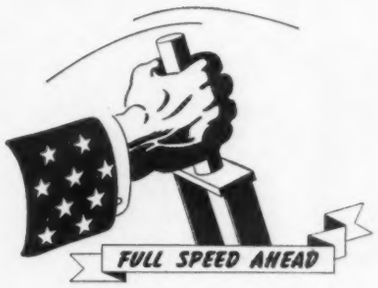
Succeeding to the management of the Washington Division is D. F. McCurrach, formerly engineer and rate man for Pacific and Northwestern Electric Co. in Portland. McCurrach, who will make his headquarters in Yakima, has been named assistant general manager in charge of the Washington Division.

● W. C. Mainwaring, head of the merchandising division of B. C. Electric Railway Co., has been appointed air raid precaution chief for the province of British Columbia. Already chairman of the Provincial Defense Committee's advisory council, Mainwaring was named to the additional post by Premier John Hart following the resignation as ARP head of the chief of police, who had suggested that authority be invested in one individual.

● W. S. Fleming, California Electric Power Co., has been appointed to the newly created position of sales manager. Fleming has been with the company nearly 20 years. His new duties will include supervision of lighting and air conditioning activities as well as merchandise sales, which he had been handling previously

● Prof. H. B. Walker, head of the agricultural engineering division of the University of California College of Agriculture and chairman of the California Committee on the Relation of Electricity to Agriculture, has been elected president of the American Society of Agricultural Engineers.

ALL OUT FOR VICTORY!



Today, America faces a "MUST"—We MUST win! We MUST spend our total time and effort towards that goal! Manpower, resources and facilities MUST be used for that cause!

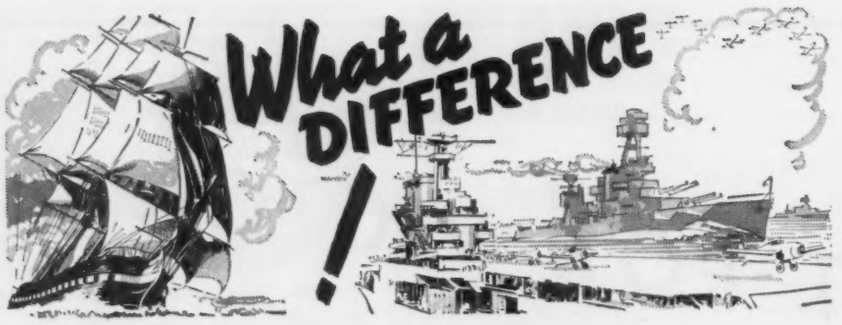
Use the facilities of General Electric Supply Corp. to obtain the best service available for procurement of War Materials. Call your nearest General Electric Supply branch for latest information on priorities and deliveries.

Electrical Materials for WAR Production Available at Conveniently Located Branches in these Western Cities:

SEATTLE, WASH.
SPOKANE, WASH.
PORTLAND, ORE.
SAN FRANCISCO, CALIF.
OAKLAND, CALIF.
SACRAMENTO, CALIF.
FRESNO, CALIF.
LOS ANGELES, CALIF.
SAN DIEGO, CALIF.
PHOENIX, ARIZ.
SALT LAKE CITY, UTAH
DENVER, COLO.
BUTTE, MONT.
BILLINGS, MONT.

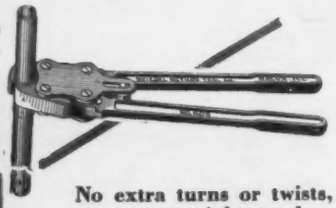
Save Time! Save Effort! Phone or drop in at your nearest G.E. Supply Office.

GENERAL ELECTRIC SUPPLY CORPORATION



And there's just as much difference between the *streamlined* BRIEGEL METHOD of making conduit connections and old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials, allowing you a larger margin of profit on each job. Make quick, easy, strong and neat connections this MODERN way.



No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only $1.25) and you have a smooth efficient job. Approved by Underwriters Laboratories.

DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey City, N. J.
General Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Pa.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., Elmhurst, N. Y. C.

BRIEGEL METHOD TOOL CO., Galva, Ill.

MARWOOD

Manufacturers' Representatives and Distributors

BROWNING MFG. CO.
"V" Drives—Paper Pulleys—Pivoted Bases

CONTINENTAL-DIAMOND FIBRE CO.
Fibre—Dilecto—Celoron—Vulcoid—Micabond

FOSTORIA PRESSED STEEL CORP.
Flexible Localites—Infra Red Equipment

ROCKBESTOS PRODUCTS CORP.
Heat Resisting Wire and Cable

H. B. SHERMAN MFG. CO.
Connectors—Lugs—Terminals

U. S. GRAPHITE CO.
Motor and Generator Brushes

MARWOOD LIMITED
357 Ninth St., San Francisco, Calif.

Los Angeles Portland Seattle

Johnston to Head U. S. Chamber of Commerce

Eric A. Johnston, of Spokane, recently was named president of the United States Chamber of Commerce. Johnston is president of the firms of Brown-Johnston Co., electrical contractor-dealer, and Columbia Electric & Mfg. Co., now engaged on war contracts.

His election breaks two records, since he is both the youngest man and the first west of Chicago to receive the honor. He was formerly president of the Spokane chamber and has been for several years a director and a vice-president of the national organization.

● ARNOLD W. RIDLEY, until recently manager of the Denver steam plant of Public Service of Colorado, died in April, following an illness of several months. His service record dated from 1891, when he started work at the plant his father helped to build for the old Denver Gas and Electric Co., later consolidated with Public Service Co. He was a native of England and was 72 years old.

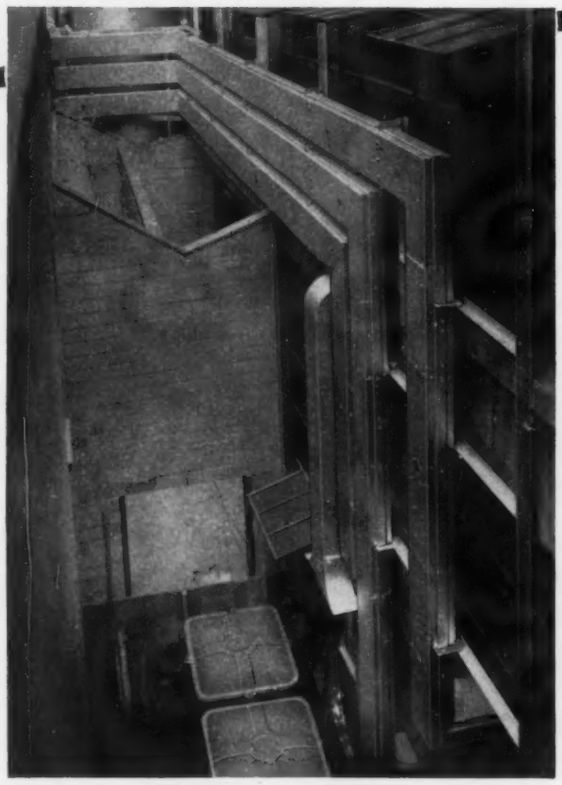
● HOWARD BULLOCK, General Electric Co., Los Angeles, is the new president of the Los Angeles chapter of the American Society of Heating and Ventilating Engineers. Other newly elected officers are: Wesley O. Stewart, Johnson Service Co., vice-president; Myron Kennedy, York Ice Machinery Co., treasurer; Leo Hungerford, Utility Fan Co., secretary.

● JOHN A. KEEGAN, 58, manager of the Cheyenne Light & Power Co. until his retirement in 1939, failed to recuperate from a recent operation. Like Arnold Ridley, he entered Public Service Co.'s employ through another concern, coming from Western Light & Power Co. in 1906.

● C. C. SNYDER, business agent of the Los Angeles Bureau of Power & Light and Carl A. Heinze have been appointed to the new industrial committee of the Los Angeles Chamber of Commerce. Their duty will be the promotion of sound industrial development for southern California.

● H. S. SCHULER, Pacific Coast division sales promotion manager for Westinghouse Electric and Manufacturing Co., has been elected president of the Industrial Marketers of Northern California. This is the regional chapter of the National Industrial Advertisers Assn.

GAIN vital production-hours . . . CONSERVE vital materials . . . by using TRUMBULL



ENCLOSED BUSBAR DISTRIBUTION SYSTEM

Gaining a month, a week . . . even a day . . . on the schedule of your new plant extension, or on power distribution changes in your present production departments, is no longer a matter of costs, it may be a matter of lives.

Trumbull Enclosed Busbar Distribution Systems are increasingly recognized as one of the most important time-saving, production-speeding developments available to America's war industries. Completely standardized . . . eliminating the need for time costly special engineering . . . installed in interconnecting sections "like running a line of railroad track" . . . they will enable your contractor to have power at the machines far ahead of ordinary schedules.

L. V. D. (LOW VOLTAGE DROP) SYSTEM for distribution of electric power in main circuits. Providing connection between transformers and switch-board for main plant feeders, main risers in office buildings, feeders to Flex-A-Power runs, secondary network feeders and current supply to groups of electrically operated machines. (See additional information in paragraph at left).

TRUMBULL FLEX-A-POWER for distribution of electric power in secondary circuits to point of load. Plug-in connections to machine load are made through FLEX-A-PLUGS which are enclosed self-contained protective devices and disconnects.

TROLLEY CLOSUR SYSTEM AND CONNECTORS safely supply power to portable electrically driven tools, hoists, etc.

All above systems fully described in detail in Trumbullaid Bulletin No. 165.

CUTS POWER LOSSES . . . DELIVERS FULL VOLTAGE

Unique new construction of the L. V. D. System cuts down power losses and delivers full voltage power at point of load. L. V. D. design, based on exhaustive electrical tests, easily withstands mechanical stresses that may result from short circuit currents as high as 100,000 R. M. S. amperes.

L. V. D. Systems and unit parts are furnished completely assembled ready for installation in minimum time. Blueprints and detailed instruction sheets accompany each shipment. Rigid structure permits installation of hangers at any point on the enclosure, providing wide latitude in installation for varying types of building construction. Being built entirely of materials not subject to deterioration L. V. D. Systems require little or no maintenance, easily withstand overloads possible in busy war industries.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY
PLAINVILLE, CONN.

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES — TRENTON, N. J. (PORCELAIN)

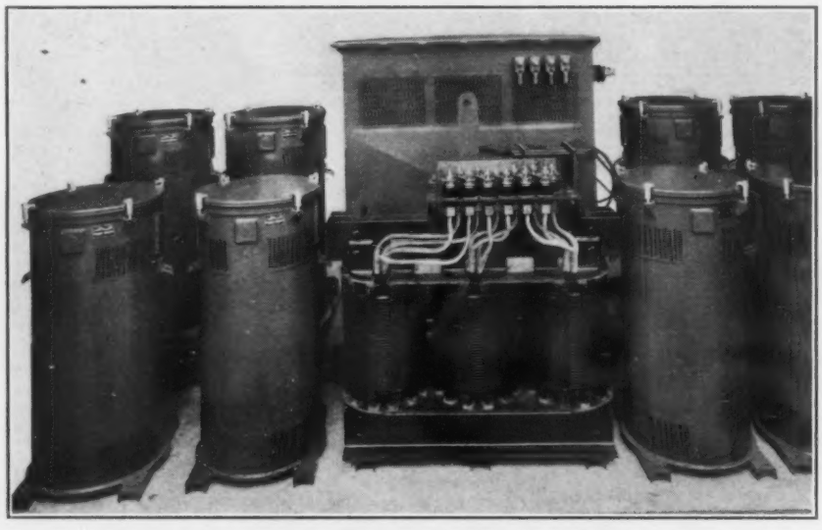
● C. R. OWENS and R. W. STEENROD have been appointed welding specialist and industrial heating specialist, respectively, of the General Electric Pacific District, it has been announced by Raymond M. Alvord, G-E commercial vice-president. E. J. Clipperly will continue as industrial heating and arc welding specialist at the Los Angeles office.

Simultaneously the appointments of A. D. Boardman as Pacific District industrial control specialist, and L. E. Donahue as industrial control specialist at Los Angeles were announced.

Owens, a native of Chico, Calif., has been with General Electric since 1923 and Steenrod joined the organization in 1933. Boardman, with G-E since 1927, was born in San Francisco. Donahue started with General Electric in 1937 after being graduated from Washington State University.

● JOHN A. CORNWALL, member of the electrical contracting firm of John A. Cornwall & Sons, 3491 West Seventh Avenue, Vancouver, B. C., died recently.

For Efficient Plant Operation Use AIR-COOLED Transformers



Center Air-Cooled Unit is 112½ KVA, 3 phase, 4000 to 120/240 volts—core and coil stands in front of completed tank to show construction. Air-Cooled Transformers on each side of center unit are 25 KVA, 460/230 to 230/115 volts.

For efficiency, for smooth operation, for ease in handling—use GARDNER Air-Cooled Transformers. No extra cost for "stay-put" transformer vaults! No oil or any other patented filling medium necessary! No worry as to final location—they are easily rearranged as you expand or further modernize your plant!

Remove that added worry from your shoulders—let GARDNER Transformers, sturdily built to your specifications, provide the answer to your voltage problems. Write for full information.

Gardner Electric Mfg. Co.
4227 Hollis St. Emeryville, Calif.

Represented by

MAYDWELL & HARTZELL
INCORPORATED
SAN FRANCISCO LOS ANGELES PORTLAND

FPC Names Beebe To San Francisco Post

John C. Beebe has been appointed by the Federal Power Commission as regional administrator of the eight western states with headquarters in San Francisco. He comes to the new post from Washington, D. C., where he has been chief of the commission's Bureau of Water Power since July, 1941.

Following his graduation from Dartmouth College and the University of Wisconsin, Beebe was engaged for nine years on various irrigation and power projects, spending all but one year of that time in the Northwest and California.

From 1929 to 1939 he was with the United States Forest Service at San Francisco and from 1936 to 1939 was regional engineer. In 1939 he went to Washington, D. C., as chief of the Power Division Flood Control Surveys, Federal Power Commission.

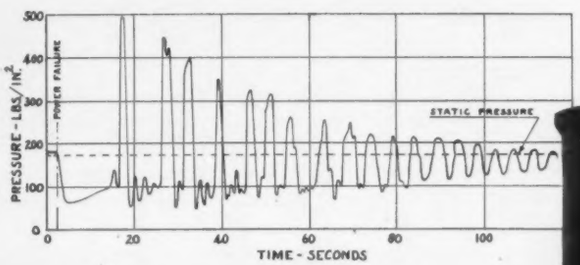
● CHARLES BALL, Idaho Springs manager for Public Service Co. of Colorado, was killed on Apr. 15 when his auto ran off a mountain curve near Nevadaville. On an inspection trip, Mr. Ball was trying to avoid a snowbank blocking the highway and hit a soft road shoulder. He recently completed 15 years of service to the utility. His duties at Idaho Springs have been assumed by Robert Green, who was transferred from the company's Denver stores department.

● W. B. LOPER, assistant chief electrical engineer, California Electric Power Co., Riverside, has been called to service in the United States Navy with the rank of lieutenant-commander. Formerly superintendent for the power company at Barstow and Brawley, Loper was engineer and assistant distribution engineer at Riverside before being appointed assistant chief electrical engineer. He served in the Navy during World War I and for two years following.

● FRANK HARRY WOODWARD, a veteran of the public utility business in California, will retire July 1. Since June, 1894, he has been connected with the public utilities of the San Francisco Bay region. Up to the time of its purchase by Pacific Gas & Electric Co. he was sales manager for Great Western Power Co. and during recent years has been in the sales department of the East Bay Division.

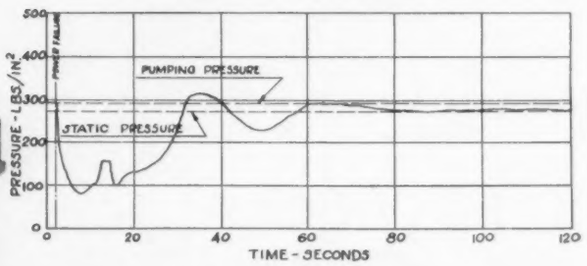
● W. C. MEARNS, illumination engineer, B. C. Electric Railway Co., Victoria, has been elected Vancouver Island district chairman of the Junior Chamber of Commerce of Canada.

Are your Water-Pumping Lines PROTECTED from RUPTURE?



Without a Surge Suppressor

Within 15 seconds after power failure the first surge wave mounts to 2½ times the static head with succeeding waves of a serious character. Pressure not yet normal after lapse of 2 minutes.



With a PELTON Surge Suppressor

A single surge wave slightly more than the static head is observed appx. 35 seconds after power failure with no subsequent surge greater than the pumping head. Normal pressure within 80 seconds.

The PELTON SURGE SUPPRESSOR

Protects Water Lines From Rupture caused by Water Hammer and Surges

Just as locomotives need safety valves, water pumping lines need the Pelton Surge Suppressor.

It protects the lines from rupture and saves money when (1) a pump driving water up hill suddenly stops, the menacing back surge of water is automatically released through the Pelton Surge Suppressor; (2) where other excessive pressures are likely, a valve actuates the Surge Suppressor controls at pre-determined pressures.

Here is assurance of protection—the Pelton Surge Suppressor. Write for free Bulletin No. 31.

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

120 BROADWAY, NEW YORK — 2929 NINETEENTH ST., SAN FRANCISCO — PASCHALL STATION, PHILADELPHIA

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, De La Vergne Sales Co., Woodward Governor Co., Cone Valve Division, Chapman Mfg. Co., and Carbondale Division, Worthington Pump & Machinery Corp.

BLW THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

● CHARLES G. SMITH, assistant engineer in the distribution engineering division of the Pacific Gas and Electric Co., has resigned to join the General Electric switchgear engineering section at the Philadelphia Works.

● E. C. ALEXANDER for many years supervisor of sales for Southern Colorado Power Co., Pueblo, Colo., recently resigned and his place as supervisor of sales is being taken by E. H. Pemberton.

● J. R. MURPHY, for 11 years manager of General Electric's Spokane office, recently was assigned to represent the company in Washington, D. C. Appointed to his post at Spokane was John F. Gogins, formerly his assistant.

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
MOUNT VERNON, N. Y.

Western Representatives:
A. R. Slimmon, 445 E. 3rd St., Los Angeles
Geo. H. Curtiss, 540 McAllister St., S. F.
H. M. Sayers, 1101 Eastlake Ave., Seattle
Stevens Sales Co., 41 P.O. Place, Salt Lake City
Felix Simon, P. O. Box 614 . . . . . Denver
H. Geo. Shefler, P. O. Box 1587 . . . Phoenix

TRADE *notes*

● RAY FOX, who joined S & M Lamp Co., Los Angeles, in 1934 in the automotive division, has taken the place of James Dieffenwierth, who had been with the company since 1929 and left to go into war production toolmaking, according to James Shirreffs, manager. Shirreffs also announced that S & M would discontinue making Alzak aluminum reflectors for the duration, confining its line to porcelain enameled units.

"WHAT CAN IT DO FOR ME?"

Advertising that is read with this thought in mind may provide the solution to a problem that has kept you awake nights.

We all know "It Pays To Advertise." It pays just as big to investigate WHAT IS ADVERTISED—every month in

ELECTRICAL WEST

G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue
We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

TRADE MARK REG. U.S. PAT. OFF.

Nichrome

***Made only by* DRIVER-HARRIS COMPANY**

Stocked for the Coast Trade at

SAN FRANCISCO
235-241 San Bruno Ave.

LOS ANGELES
449 South San Pedro St.

SEATTLE
2122 Fourth Ave.

By

ANGUS-CAMPBELL, INC.

● FURTHER EXPANSION is planned by the Electric Panelling Manufacturing Co., Vancouver, B. C., engaged in the production of light and power switch boxes, fuse boxes and a wide variety of other allied equipment. The firm was established in 1921 by W. E. Hughes, one of the oldest members of the industry in British Columbia. Hughes has as his partner, J. S. Don, also prominent in the industry on the Coast. The company was started on a very small scale with three employees and has now expanded until it is giving employment to 25 persons.

● J. B. COLESWORTHY has been appointed Los Angeles District sales representative by the Crocker-Wheeler Electric Mfg. Co. He previously was in the Los Angeles sales organization of Westinghouse Electric & Mfg. Co. His new territory will include southern California, Arizona and southern Nevada.

● MCGRAW-HILL Co. of California has opened a Los Angeles district office in the Edison Building, 601 W. Fifth St. Roy N. Phelan is manager, H. C. Rowell, assistant manager, of the new office.

● W. G. PATTERSON, associated with Hygrade Sylvania for some years, has been advanced to the place made vacant by the resignation of R. W. Maxwell from Sylvania Pacific Co., Los Angeles, according to Perry Demarest, manager.

● S. F. RICKETTS ELECTRIC LTD. announces that L. G. Sewell has now joined him. This electrical contracting and engineering organization will be known as Ricketts-Sewell Electric, Ltd., 429 Pender street west, Vancouver, B. C.

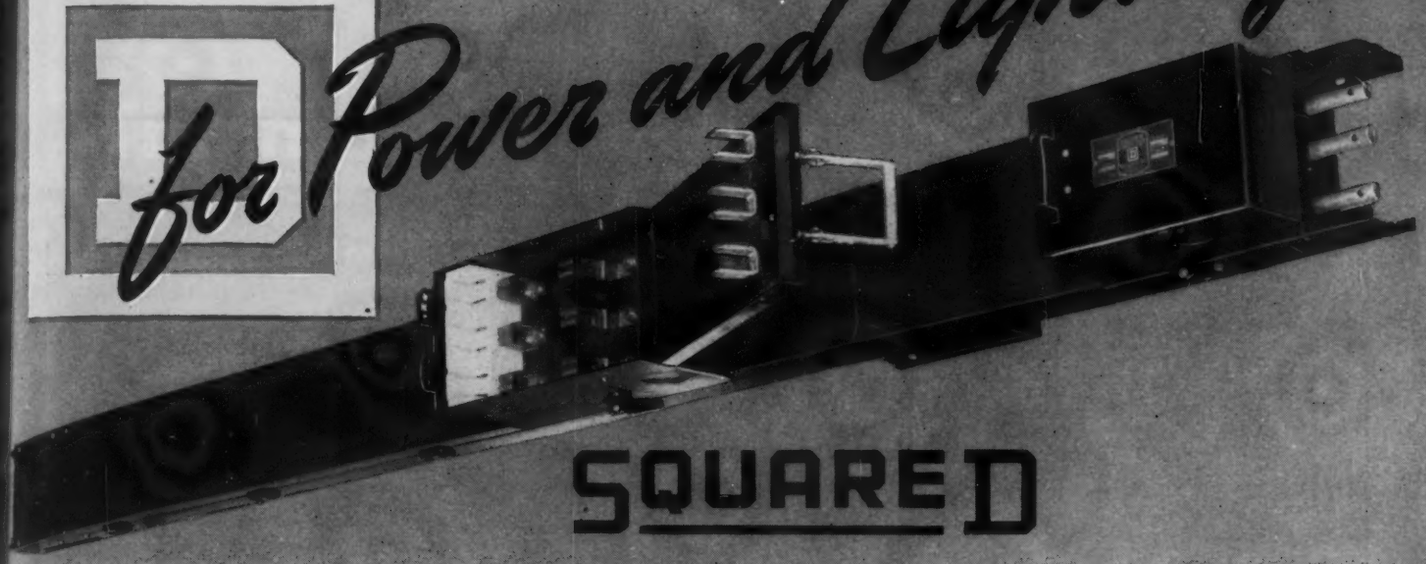
● COLE ELECTRIC Co., Los Angeles, has moved its office and factory to 1510 S. Los Angeles St.

Directory Corrections—

In listing the local representatives of Curtis Lighting, Inc., in its advertisement appearing in the April Manufacturers' Directory Section, the address of W. K. Turner was incorrectly shown as Denver. Mr. Turner's address is Terminal Sales Bldg., Seattle, Wash.

Listing of Illinois Electric Porcelain Co. representatives in the April Manufacturers' Directory was incorrect. Joslyn Co. of California has been its representative on low tension porcelain for approximately 30 years in California, Arizona, Hawaii and the Philippines.

for Power and Lighting

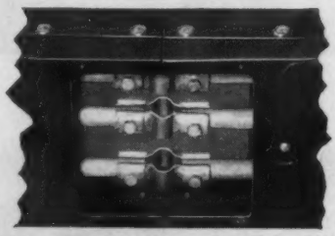


SQUARE D

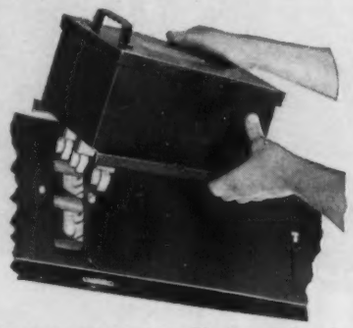
SAFLEX PLUG-IN DUCT

EASY TO INSTALL—PERMITS SPEEDY EXPANSION OR REARRANGEMENT

PORCELAIN INSULATORS are of heavy cross-section with surface corrugations to increase electrical spacings. They are securely mounted every 20" to casings by steel brackets and protected against breakage by shock-absorbing felt pads. Round rigid bus bars are anchored against endwise movement by stop-pin at end insulators.



FLEXIBLE COUPLINGS join bus bars. Special design permits expansion or contraction of bus bars to be absorbed at the joint, and also provides flexible connections for correction of minor variations in bus alignment.

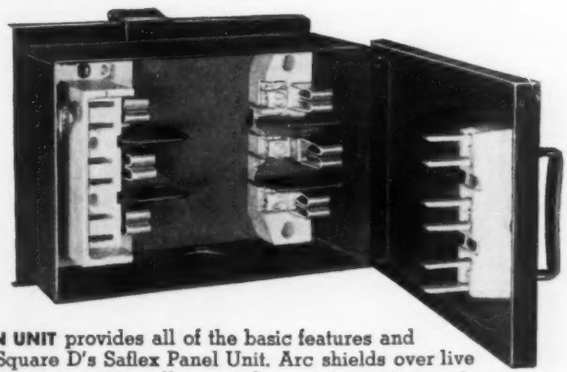


UNITS EASY TO ATTACH. Hook-type bracket on top of plug-in unit attaches to top of duct. Unit is then swung down and jaws snap into position on bus bars. Tightened securely with a single screw—on or off in a jiffy. 12 units may be attached to each 10' section.

SAFLEX PLUG-IN DUCT provides the kind of electrical distribution needed for today's vital production jobs—makes it easy to revise or expand in the future, on a moment's notice. One hundred per cent salvage value for re-use.

Saflex Duct features *round* busses. Equal strength in all directions eliminates sagging of conductors between insulators. And round bus rigidity prevents deflection from heavy inrushes of current. 250, 375 and 750 ampere capacity duct utilizes *tubular* copper busses; 500 and 1000 ampere, *solid* copper busses. Both types have the same (⅞") outside diameter. Rigid steel enclosure assures permanent alignment.

Write for complete details of Saflex Duct, the modern answer to maximum flexibility in location and capacity—with minimum loss of time.



SAFLEX PLUG-IN UNIT provides all of the basic features and advantages of Square D's Saflex Panel Unit. Arc shields over live contacts. When cover is open, all exposed current-carrying parts are dead. Positive pressure fuse clips and steel-backed copper contact jaws are used on all sizes. Saflex plug-in units are available in 2 and 3 pole and 3 phase, 4 wire 30 to 200 amperes inclusive, 230 and 575 volts. All units are horsepower rated.

SQUARE D COMPANY

LOS ANGELES - DETROIT - MILWAUKEE

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

INDEX TO ADVERTISERS

JUNE, 1942

Allis-Chalmers Mfg. Co. 7, 19
Aluminum Company of America 127
American Steel & Wire Co. 46, 47
Anaconda Wire & Cable Co. 129, 137

Brewer-Titchener Corp. 45
Briegel Method Tool Co. 144
Bull Dog Electric Products Co. 22
Burndy Engineering Co., Inc. 130

California Oregon Power Co. 76, 77
Chance Co., A. B. 18
Columbia Steel Co. 46, 47
Copperweld Steel Co. 24
Crescent Ins. Wire & Cable Co. 6
Crocker First National Bank 18
Curtis Lighting, Inc. 15

Driver-Harris Co. 148
Drop Forging Ass'n. 134

Everstick Anchor Co. 26

Fast & Co., John E. 28

Gardner Elec. Mfg. Co. 146
G. C. A. Mfg. Co. 148
General Electric Co.
Bridgeport 4, 5, 35
Cleveland 25
Schenectady 1, 31, 43, 131
General Electric Co. (Appliance Service Center) 139
General Electric Supply Corp. 143
Graybar Elec. Co., Inc. 140

Hesse & Co., W. A. 136
Honn Co., Geo. E. 142
Hubbard and Company ..... 3rd Cover

Idaho Power Company 76, 77
Ideal Commutator Dresser Co. 138
Illinois Elec. Porcelain Co. 37
Indiana Steel & Wire Co. 18

Jeffries Transformer Co. 138
Johns-Manville Corp. 29

Klein & Sons, Mathias 8
Kortick Mfg. Co. 138
Kuhlman Electric Co. 133

Lang Mfg. Co., F. S. 10
Lapp Insulator Co., Inc. 9
Line Material Company 49
Lloyd Products Co. 16

Marwood Limited 144
Mica Insulator Co. 17
Miller Company, The 141
McGraw-Hill Publ. Co., Inc. 33, 34

National Elec. Products Corp. 30
National Tel. Supply Co. 134
Northwest Elec. Light & Power Ass'n. 42

Ohio Brass Company 3
Okonite Company, The 50
Okonite-Callender Cab'e Co., The 50

Pacific Coast Elec'l Ass'n. 40
Pacific Coast Elec'l Bureau ..... 4th Cover
Pacific Elec. Mfg. Corp. 21
Pacific Gas and Electric Co. 38, 39
Paine Company 142
Pelton Water Wheel Co. 147
Penn-Union Elec. Corp. 32
Portland General Elec. Co. 76, 77
Puget Sound Power & Light Co. 76, 77

Railway & Indus. Eng'g Co. 11
Reliable Electric Co. 10
Roebling's Sons Co., John A. 20

San Diego Gas & Electric Co. 36
Schweitzer & Conrad, Inc. 23
Smoot-Holman Co. 136
Southern California Edison Co. ..... 2nd Cover
Square D Company 149
Superior Instruments Co. 132

Thermador Elec. Mfg. Co. 26
Tork Clock Co., The 148
Treasury Department 41
Trico Fuse Mfg. Co. 130
Trumbull Elec. Mfg. Co. 145

United States Steel Corp. 46, 47
Utah Power & Light Co. 76, 77

Victor Insulators, Inc. 14

Wagner Electric Corp. 27
Ward Leonard Elec. Co. 132
Webster Electric Co. 125
Westinghouse Elec. & Mfg. Co.
Cleveland 135
East Pittsburgh 12, 13
Weston Elec. Instrument Corp. 44
Wiremold Company, The 26

PROFILES *of the month*

Above: Roy S. Spaeth (left) 17-year employee of Los Angeles Bureau of Power & Light, receives the National Safety Council President's medal from Clarke Keely, personnel committee chairman, Board of Water and Power Commissioners. Spaeth saved the life of a fellow lineman who came in contact with a 2,400-volt circuit. Above right: Col. H. S. Bennion, EEI managing director on tour of the west last month is shown with his cousin Dr. Adam Bennion (left foreground), Utah Power & Light Co. Right: M. "Mike" Rhine, appointed manager of General Electric Co.'s Pacific district industrial department. He joined G-E in 1904 as student engineer; has worked in the West since 1906

A group of California Electric Power Co. officials is about to climb aboard the new "bus" which has supplanted individual company cars on the run between Riverside headquarters and the Imperial Valley offices. The bus goes down one day and returns the next, conserving tires and gasoline. From left to right: J. S. Boardwell, J. E. Collins, Wm. E. Humphreys, A. C. Cage and A. B. West, president

-The most important cog in the wheels of industry

JUST as the armed forces of this nation rely on the constant and adequate supply of finished materials and equipment ---every man and machine in the front lines of production relies on *Electrical Power* to keep gears and shafts turning. Without this important cog, the wheels of American industry would come to a complete standstill. To keep power flowing uninterruptedly over transmission and distribution lines has required carefully engineered pole line hardware produced by Hubbard and Company. In all Hubbard products, quality has never been rationed.

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- *Standard Pole Line Hardware*
- *Communication System Hardware*
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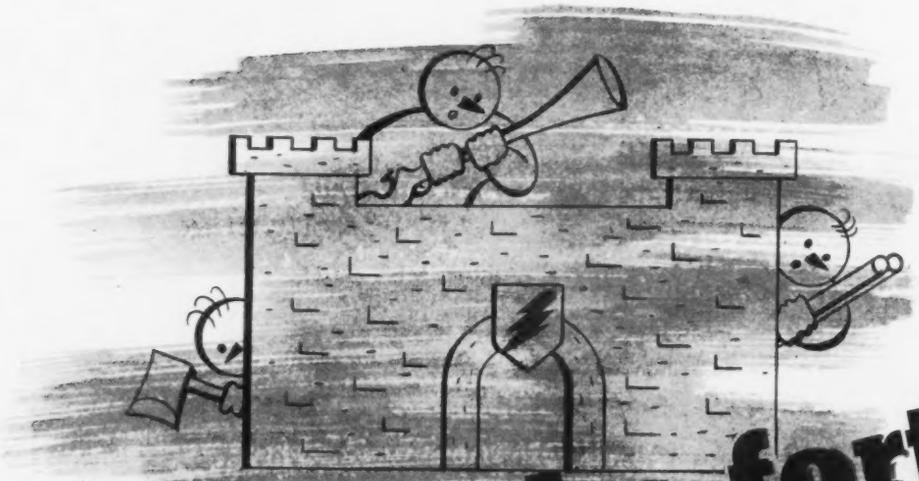
HANG THE LOAD ON HUBBARD HARDWARE



Hold the fort!

AT THIS MOMENT thousands of electric, hardware and appliance dealers are reeling from the effect of wartime restrictions and freezing orders. Some have decided they can't go on. Others are on the point of closing. Yet many thoughtful people are asking—do these merchants have the facts which might enable them to hold out? Have they really exhausted *all* the possibilities for staying in business?

Your Bureau has heard these questions so often it decided to do some investigating on its own, and called on a number of our industry leaders to find what opportunities they see in the present situation.

This is what we found:

1 There is still some priority business to be had if you know where to look and how to go about getting it. At your request, a Bureau man will call on you and explain the whole priority situation in detail.

2 There is a large and growing amount of repair and servicing work to be done, and every promise of an industry-wide promotion of this business soon. In some areas, promotion has already started.

3 There is an actual shortage of skilled mechanical help for making improvements in shop layout, rearranging machinery, helping the farmer correct inefficient equipment, and doing other jobs which might be called "personal service jobs"—requiring little or nothing in the way of critical materials.

4 There is work to be done in lighting. Mazda lamp sales are still under the limit and the same is true of most types of light conditioning equipment. Moreover, with people working the way they are, there is vastly more need for conditioned lighting than ever before.

Here are four ideas. Any one of them could be applied with enough vigor and imagination to stave off failure, but our suggestion is a program based on *all four*. Why not call your local Bureau office today and talk it over.

PACIFIC COAST ELECTRICAL BUREAU

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